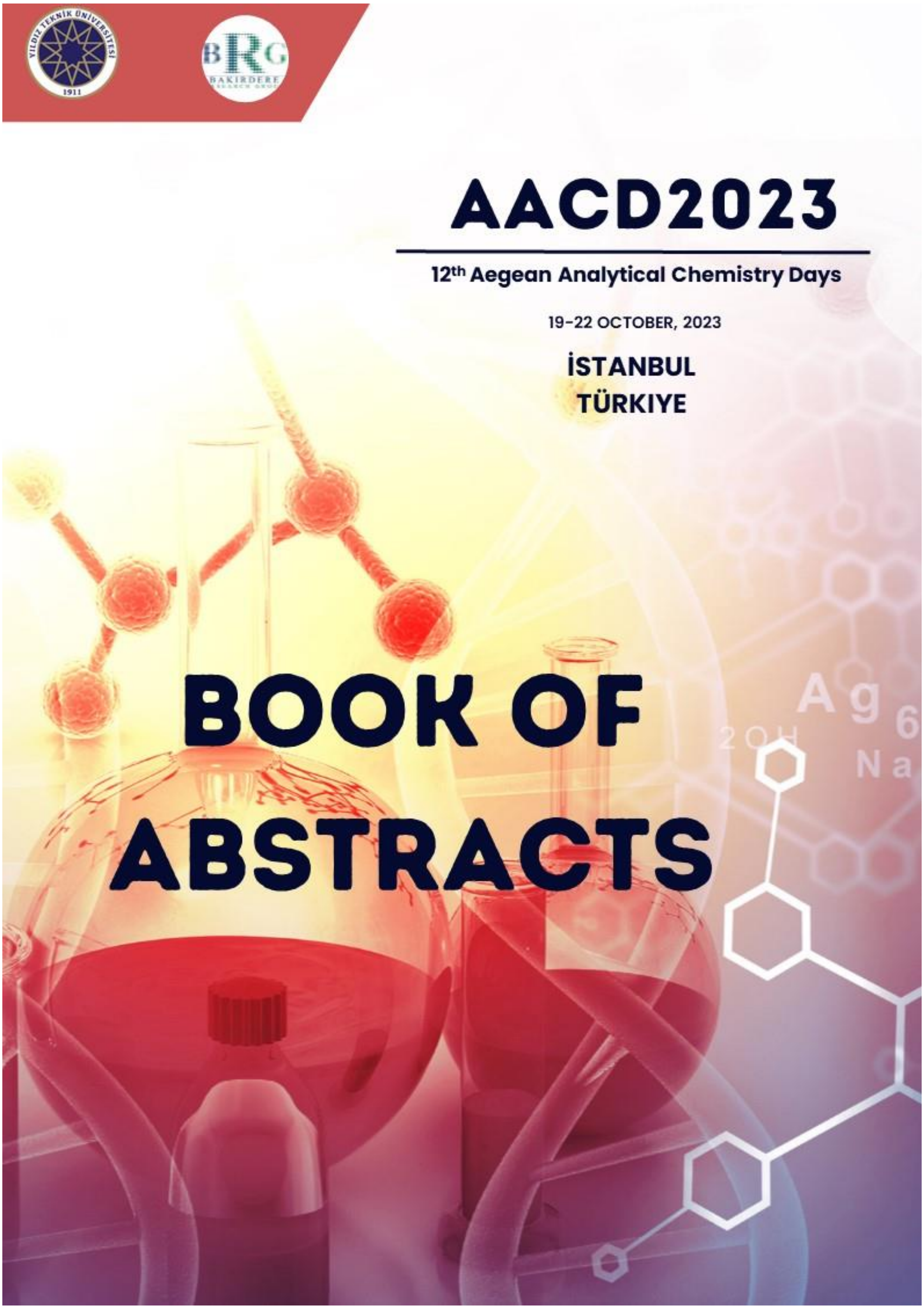

AACD2023

12th Aegean Analytical Chemistry Days

19-22 OCTOBER, 2023

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Thursday, Oct 19th , 2023

08:30 – 09:45 **Registration**

Davutpasa Convention Centre

09:45 – 10:20 **Opening Ceremony**

Davutpasa Convention Centre, Big Hall

10:20 – 10:45 **Music Recital**

Davutpasa Convention Centre, Big Hall

General Session 1 Chair: Dr. Şeref GÜÇER

10:45 – 11:35 **[IL01] (Big Hall)**

Dr. Zoltan MESTER

“Use of Micro-plasmas for Metal Speciation”

11:35 – 12:15 **[IL02] (Big Hall)**

Dr. Antony CALOKERINOS

“Analytical Chemistry and Circular Economy”

12:15 – 12:25 **Memorial Session (Big Hall)**

In memory of Dr. Osman Yavuz ATAMAN

12:25 – 12:40 **Tecknowledge Presentation_01 (Big Hall)**

Newtech Chemical Company

	Oral Session 1 **Prof. Dr. Osman Yavuz ATAMAN Hall** **Chair: Dr. Sema DEMİRCİ ÇEKİÇ**	**Oral Session 2** **Prof. Dr. Mehmet DOĞAN Hall** **Chair: Dr. Ayşegül GÖLCÜ**	**Oral Session 3** **Prof. Dr. Güler SOMER Hall** **Chair: Dr. Halil İbrahim ULUSOY**
12:45 – 13:00	**[OP01]** **Müge YERMEYDAN PEKER** *“Dual-Function Antioxidant Capacity Measurement Using A Single Chromogenic Reagent”*	**[OP04]** **Zeynep KALAYCIOĞLU** *“Synthesis, Characterization and Photocatalytic Dye Degradation Activity of the Ternary Composite Composed of Cerium Oxide Nanoparticles, Graphene Oxide and Polyacrylamide”*	**[OP07]** **Nouha BAKARAKI TURAN** *“The Cohort of Concern Compounds: A New Era in the Future of Pharmaceuticals and Drug Development”*
13:00 – 13:15	**[OP02]** **Bihter ŞAHİN** *“Determination of Phenolic Contents, Antioxidant Activity and Tyrosinase Inhibition of Ficus carica Leaf Extracts”*	**[OP05]** **Nilay KAHYA** *“Removal of Fluoride Ions from Water by Cerium Oxide Nanoparticles Doped Cerium-Carboxymethyl Cellulose: Optimization, Adsorption Isotherm and Kinetic Studies”*	**[OP08]** **Mehmet ATAKAY** *“Isomeric Analysis of Drug Molecules Using Trapped Ion Mobility-Mass Spectrometry Technique”*
13:15 – 13:30	**[OP03]** **Ülkü Nida ÇOLAK** *“Evaluation of Antioxidant Activity and Total Phenolic Contents in Anatolian Royal Jellies”*	**[OP06]** **Zeynep MARAŞ** *“The Investigatıon of Survivability and Bioaccumulatıon of the Zinc Sulphur-NPs on Gammarus Pulex”*	**[OP09]** **Kamila KOSZELSKA** *“Electrochemical Sensing of A Novel Tyrosine Kinase Inhibitor”*

13:30 – 14:15 **LUNCH**

14:15– 15:00 **Poster Session 1**

General Session 2 Chair: Dr. Yücel ŞAHİN

15:00 – 15:40 **[IL03] (Big Hall)**

Dr. Jiri DEDINA

“The Significance of The Radical Theory of Hydride Atomization for Trace Element Analysis”

15:40 – 16:20 **[IL04] (Big Hall)**

Dr. Mustafa SOYLAK

“Research Progress in the Use and New Applications of Microextraction and Solid Phase Extraction for Water and Food Analysis”

16:20 – 16:30 **Tecknowledge Presentation_02 (Big Hall)**

KPDN

16:30 – 16:45 **Coffee Break**

	Oral Session 4 **Prof. Dr. Osman Yavuz ATAMAN Hall** **Chair: Dr. Fırat AYDIN**	**Oral Session 5** **Prof. Dr. Mehmet DOĞAN Hall** **Chair: Dr. Durişehvar ÜNAL**	**Oral Session 6** **Prof. Dr. Güler SOMER Hall** **Chair: Dr. Bedia ERİM BERKER**

16:45 – 17:00	**[OP10]** **Özgür ÖZALP** *“Efficient Dispersive Solid-Phase Microextraction of Three Triazole Fungicides from Fruit Juices and Water Samples Using A Ni-Co MOF/ Zn-NTA Nanoflowers Hybrid Composite”*	**[OP14]** **Aslı BAYSAL** *“Impact of Soluble and Exchangeable Concentrations of Elements in Surface Sediments from Recreational Areas on Culturable Bacterial Behaviors”*	**[OP17]** **Serkan KARAKAYA** *“An Application to Electrochemical Determination of Covid-19 Drug: Favipiravir at Pencil Graphite Electrode Boosted with Functionalized-Carbon Nanotubes”*
17:00 – 17:15	**[OP11]** **Rukiye ZENGİN** *“Chemical Composition of Fruits and Leaves of Some Black Mulberry, Chokeberry and Elderberry Genotypes”*	**[OP15]** **Esra SU** *“Mechanical and Microstructural Properties of Alginate and Composite Films”*	**[OP18]** **Kader VURAL** *“Electrochemical Determination of Entacapone, An Antiparkinson Drug Active Ingredient, Using Pencil Graphite Electrode”*
17:15 – 17:30	**[OP12]** **Songül ULUSOY** *“Development of A Fabric Phase Extraction-based Sensitivenalysis Method for the Determination of Levetiracetam and Lamotrigine Drug Molecules”*	**[OP16]** **Ebru EROL** *“Isolation and Characterization of Bioactive Secondary Metabolites of the Endemic & Edible Polygonum sivasicum by Nuclear Magnetic Resonance Spectroscopy together with Comprehensive Chemical Analysis”*	**[OP19]** **Merve Hatun YILDIR** *“Redefining Precision in Cancer Treatment: A Novel Electrochemical Approach Using Bimetal Oxide Composites for Niraparib Quantification”*
17:30 – 17:45	**[OP13]** **Ümmügülsüm POLAT** *“Simultaneous Determination of Pravastatine Sodium and Glipizide Drug Molecules After Fabric Phase Microextraction”*		**[OP20]** **Abdullah-Al FAYSAL** *“Development and Fabrication of A Molecularly Imprinted Polymer-based Electroanalytical Sensor for the Determination of Acyclovir”*
17:45– 18:30 **Poster Session 2**			
19:00 – 22:00	**OPENING COCKTAIL**		

Friday, Oct 20th , 2023

General Session 3 Chairs: Dr. Mehmet YAMAN

09:00 – 09:40 **[IL05] (Big Hall)**

Dr. Ryszard ŁOBIŃSKI

"Advanced Mass Spectrometry in Elemental Speciation Analysis"

09:40 – 10:20 **[IL06] (Big Hall)**

Dr. Nikolaos THOMAIDIS

"Exploring The Chemical Universe of Environmental Samples Through Cutting-edge Analytical Methodologies and Advances Chemometric Techniques"

10:20 – 10:30 **Memorial Session (Big Hall)**

In memory of Dr. Mehmet DOĞAN

10:30 – 10:45 **Tecknowledge Presentation_03 (Big Hall)**

10:45 – 11:00 **Coffee Break**

	Oral Session 7 **Prof. Dr. Osman Yavuz ATAMAN Hall** **Chair: Dr. Mustafa Zafer Özel**	**Oral Session 8** **Prof. Dr. Mehmet DOĞAN Hall** **Chair: Dr. Nicolaos Lydakis-Simantiris**	**Oral Session 9** **Prof. Dr. Güler SOMER Hall** **Chair: Dr. Yusuf Dilgin**
11:00 – 11:15	**[OP21]** **Triantafyllos ALBANIS** *"Novel HRMS Approaches for the Analysis of Pesticide Residues in High Consumption Fruit Commodities"*	**[OP27]** **Üzeyir DOĞAN** *"Quantification of Some Metallic Content of Aronia Melanocarpa L. Plant with ICP-OES"*	**[OP33]**
11:15 – 11:30	**[OP22]** **Halil İbrahim ULUSOY** *"Easy Applications of Solid Phase Extraction for Sensitive Analysis of Drug Molecules by Conventional HPLC System"*	**[OP28]** **Aslı BAYSAL** *"Determination of Soluble and Geochemically Reactive Concentrations of Metals in Surface Sediments from Lakes in Marmara Region-Turkey, and Their Risk Assessment"*	**[OP34]** **Bakr ALDOORI** *"Development of an Advanced Electrochemical Sensor for Detection of Antioxidants based on Porous Metal Organic Frameworks"*
11:30 – 11:45	**[OP23]** **Kartal ÇETİNTÜRK** *"Determination of N-Nitrosamines in the Gas-Chromatography Coupled with Tandem Mass Spectrometry (GC-MS/MS) by Using Hydrogen as Carrier Gas and the Investigation of Their Mass Spectrums under the Plausible of Hydrogenation"*	**[OP29]** **Oktay CANKUR** *"Development of A Triple ID-ICP-MS Method for SI Traceable Measurement of Pd in Waste Printed Circuit Board Material"*	**[OP35]** **Dilek ESKİKOY BAYRAKTEPE** *"Electrochemical DNA Biosensor Based on Screen Printed Carbon Electrode Modified with P(L-Methionine)/Au-Pt Nanoparticles/DNA for the Detection of Erlotinib"*
11:45 – 12:00	**[OP24]** **Beyza YÜCE** *"A Scientific Research on the Presence of Bisphenol A (BPA) and Di-(2-Ethylhexyl) Phthalate (DEHP) Released from Different Plastic Containers into Citrus Oils"*	**[OP30]** **Nurdan AKAKÇE** *"Monitoring of Radionuclides and Heavy Metals From Wetlands in Kirklareli"*	**[OP36]** **Sevda AKAY SAZAKLIOĞLU** *"Biosensor Microchips: The Study of the Response of the Pencil Graphite Electrode against Carcinoembryonic Antigen (Cea) to be Used in Microchip Applications"*
12:00 – 12:15	**[OP25]** **Çağlar DEMİRBAĞ** *"Simultaneous Determination of Tenofovir Disoproxil and Emtricitabine by Hydrophilic Interaction Liquid Chromatography in Tablet Dosage Forms"*	**[OP31]** **Nuray GÜY** *"Designing Mo_2C/C Modified BiOI Heterojunction Nanocomposites for Enhanced Photocatalytic Efficiency"*	**[OP37]**
12:15 – 12:30	**[OP26]** **Cemil AYDOĞAN** *"Development of Neutral Monoliths for Proteomics Analysis in Nano-Liquid Chromatography"*	**[OP32]** **Gökhan SARP** *"Graphitic Carbon Nitride and Magnetic Nano Diamond ($g\text{-}C_3N_4@NDs@Fe_3O_4$): A Multifunctional Nanomaterial for Magnetic Solid Phase Extraction and Photocatalytic Degradation of Sildenafile Citrate"*	**[OP38]** **Pelin ŞENEL** *"Multi-Spectroscopic and Voltammetric Studies on the Interactional of Anticancer Drug Cladribine with Double Helix Deoxyribonucleic Acid"*
12:30 – 13:30	**Poster Session 3**		
13:30 – 14:15	**LUNCH**		

General Session 4 Chair: Dr. Reşat APAK

14:15 – 14:55 **[IL07] (Big Hall)**

Dr. Anastasia HISKIA

"Advanced Oxidation Processes for Water Purification from Cyanotoxins and Taste & Odor Compounds"

14:55 – 15:35 **[IL08] (Big Hall)**

Dr. Önder METİN *"An Overview of Advanced Analytical Techniques Used in Nanomaterial Characterization with the Case Studies"*			
15:35 – 15:50 **Tecknowledge Presentation_04 (Big Hall)** **NEGANS**			
15:50 – 16:00 **Coffee Break**			
	Oral Session 10 **Prof. Dr. Osman Yavuz ATAMAN Hall** **Chair: Dr. Okan Tarık KOMESLİ**	**Oral Session 11** **Prof. Dr. Mehmet DOĞAN Hall** **Chair: Dr. Mehmet KORKMAZ**	**Oral Session 12** **Prof. Dr. Güler SOMER Hall** **Chair: Dr. Georgios THEODORIDIS**
16:00 – 16:15	**[OP39]** **Mustafa Zafer ÖZEL** *"Green Chemistry and Some Applications in the Food and Pharma Industries"*	**[OP45]** **Merve VURUCUEL** *"Production of Complete Blood Count Reagents for Hemogram Devices and Monitoring of Analytical Performance Parameters"*	**[OP51]** **Hamid HASHEMI-MOGHADDAM** *"Uric Acid Analysis in Body Fluid by A Novel Biosensor based on Molecularly Imprinted Polymer Coated Nanofiber Composite"*
16:15 – 16:30	**[OP40]** **Nebiye KIZIL** *"Deep Eutectic Solvent Dispersive Liquid Liquid Microextraction Methods for the Analysis of Chlorophyll"*	**[OP46]** **Sinem DEMİR** *"In-Vitro Release Study of Pt(II) And Fe(III) Metallocefotaxime Drug Candidates in pH Dependent Releasing Mediums Mimicking Human Biological Fluids"*	**[OP52]** **Çiğdem KANBEŞ DİNDAR** *"Nonenzymatic Electrochemical Determination of Metrafenone in Biological Sample based on Iridium Oxide Nanoparticle and Ionic Liquids"*
16:30 – 16:45	**[OP41]** **Amir Abbas MATİN** *"3D-Printed Sorbents for Solid-Phase and Thin Film Microextractions; Applications in Environmental, Biomedical and Food Analysis"*	**[OP47]** **Yavuz Selim TOKSÖZ** *"Purification of Phenylalanine Ammonium Lyase Enzyme from Clover Leaf and Determination of its Kinetic Properties"*	**[OP53]** **Erkan YILMAZ** *"Synthesis of Ag and TiO_2 Nanoparticles Modified Polyacrylonitrile Nanofibers as Reusable SERS Platform for Analysis of Trace Organic Contaminants"*
16:45 – 17:00	**[OP42]** **Melike KÜÇÜK** *"Investigation of The Effectiveness of Dummy Molecularly Imprinted Polymer for the Rapid and Selective Extraction of Monoester Phthalates from Urine"*	**[OP48]** **Maryam MOEINI ALISHAH** *"Purification of Polyphenol Oxidase Enzyme from Avocado by Affinity Chromatography"*	**[OP54]** **Ayşegül ERGENLER** *"Cytotoxic and Genotoxic Effects of Cobalt Nanoleaves on Daphnia Magna"*
17:00 – 17:15	**[OP43]** **Hassan Elzain Hassan AHMED** *"Extraction of Prednisone in Natural and Artificial Biological Liquids with Magnetic Nanodiamond/MOF-199 Nanocomposite Prior to Determination by HPLC"*	**[OP49]** **Burcu ORHAN** *"Preparation and Investigation of PVA-CMC-Cerium Oxide Gel Foams as A Wound Dressing"*	**[OP55]** **Mehmet ÖZTÜRK** *"Determination of Foreign Enzymes in Honey: Adulteration Detection Studies"*
17:15 – 17:30	**[OP44]** **Furkan UZCAN** *"Synthesis and Application of Fe_3O_4-MIL-53(Fe)@MXN Hybrid Nanomaterial for μ-Solid Phase Extraction of Trace Cadmium from Offal and Water Samples"*	**[OP50]** **Hacı Mehmet KAYILI** *"Machine Learning-Assisted Mass Spectrometry-Based Glycomics: The Fast Diagnosis of Gastric Cancer"*	**[OP56]** **Muhammad Balal ARAIN** *"Synthesis of Nanodiamond with Layered Double Hydroxide Nanocomposite as An Adsorbent for Toxic Element Extraction"*
17:30 – 17:45 **Coffee Break**			
17:45- 18:30	**Poster Session 4**		

Saturday, Oct 21th, 2023			
General Session 5 **Chairs: Dr. Mustafa SOYLAK**			
09:00 – 09:40 **[IL09] (Big Hall)** **Dr. Reşat APAK** *“Recent Developments in the Determination of Antioxidant Activity and Oxidative Status Using Spectroscopic and Electroanalytical Methods, Also Incorporating Nanotechnology”*			
09:40 – 10:20 **[IL10] (Big Hall)** **Dr. Georgios THEODORIDIS** *“FoodOmicsGR, National Research Infrastructure for The Comprehensive Characterisation of Foods and Samples from Nutritional Intervention”*			
10:20 – 10:30 **Memorial Session (Big Hall)** *In memory of Dr. Güler SOMER*			
10:30 – 10:45 **Tecknowledge Presentation_05 (Big Hall)** **Metrohm Turkey**			
10:45 – 11:00 **Coffee Break**			
	Oral Session 13 **Prof. Dr. Osman Yavuz ATAMAN Hall** **Chair: Dr. Yücel KADIOĞLU**	**Oral Session 14** **Prof. Dr. Mehmet DOĞAN Hall** **Chair: Dr. Mehmet ÖZTÜRK**	**Oral Session 15** **Prof. Dr. Güler SOMER Hall** **Chair: Dr. Ayşegül GÖLCÜ**
11:00 – 11:15	**[OP57]** **Qamar SALAMAT** *“Extraction of Curcumin From Water and Food Samples Using A Novel Switchable and Reusable Deep Eutectic Solvent Followed by Spectrophotometric Analysis”*	**[OP61]** **Zainab Macid Salim AL-LAMI** *“Synthesis of Oxidase-Mimetic Manganese Oxide Nanoparticles by $KMnO_4$ Reduction Using Ascorbic Acid and Its Application to DNA Oxidation”*	**[OP65]** **Lokman LİV** *“Electrocatalytic Determination of Uric Acid with Poly(Tartrazine) Modified Pencil Graphite Electrode in Human Serum and Artificial Urine”*
11:15 – 11:30	**[OP58]** **Asiye ÜÇER** *“A Kinetic Study on the Degradation of Ascorbic Acid in An Alkali Medium Using UV Kinetic Spectrophotometric Measurements”*	**[OP62]** **Selen ÇUBUKLU** *“A Redox-Based Approach for the Visual Detection of Nitroaromatic Energetic Materials”*	**[OP66]** **Sezgin YAŞA** *“Recycling of Spent Li-Ion Batteries for Production of Metal Sulphide as Supercapacitor Electrode Material”*
11:30 – 11:45	**[OP59]** **Büşra YÜKSEL** *“Spectrophotometric Quantification of Tobramycin and Dexamethasone in Combined Pharmaceutical Using PLS Regression Model”*	**[OP63]** **Seda UZUNBOY** *“Generation of Reactive Oxygen Species by Fe(II)/Na_2SO_3 and Determination Using 3,3',5,5'Tetramethylbenzidine”*	**[OP67]** **Selva BİLGE** *“Evaluation and Detailed Characterization of SnO_2-ZnO Mixed Nanoparticles in Terms of Electrode Modification MaterialF”*
11:45 – 12:00	**[OP60]** **Gizem TİRİS** *“Simultaneous Determination of Some Heart Failure Drugs by Spectrophotometric Methods and Green Analysis”*	**[OP64]** **Batuhan YARDIMCI** *“Colorimetric Approaches for the Determination of Ionic Species Using Natural Sources as Green Chromogenic Reagents”*	**[OP68]** **Wiem BOUALI** *“Advancements in Electrochemical Sensing for the Precise Determination of Ribociclib, an Essential Anticancer Drug in Breast Cancer Treatment”*
12:00- 13:00	**Poster Session 5**		
13:00 – 13:45	**LUNCH**		
14:00 – 19:00	**EVENT**		
19:00 – 22:00	**GALA DINNER**		

Sunday, Oct 22th , 2023

General Session 6	**Chairs: Dr. Zoltan MESTER**		
09:30 – 10:10 **[IL11] (Big Hall)**	**Dr. Elia PSILLAKIS** *“Vacuum-Assisted Headspace Microextraction: From Theory to a New Product”*		
10:10 – 10:50 **[IL12] (Big Hall)**	**Dr. Okan Tarık KOMESLİ** *“Endocrine Disruptor Compounds: Their Treatment and Determination Strategies in Environmental Samples”*		
10:50 – 11:00 **Coffee Break**			
	Oral Session 16 **Prof. Dr. Osman Yavuz ATAMAN Hall** **Chair: Dr. Erkan YILMAZ**	**Oral Session 17** **Prof. Dr. Mehmet DOĞAN Hall** **Chair: Dr. Hasan ÇABUK**	**Oral Session 18** **Prof. Dr. Güler SOMER Hall** **Chair: Dr. İlknur DURUKAN TEMUGE**
11:00 – 11:15	**[OP69]** **Veselina ADIMCILAR** *“Preparation of pH Sensitive Purple Basil Extract Enriched Biopolymeric Film for Potential Food Preservation and Monitoring of Food Freshness”*	**[OP72]** **Feyzullah TOKAY** *“Preconcentration of Pb(II) and Cd(II) with Coomassie Brilliant Blue G-250 Dye Modified Silica Gel Prior to FAAS Determination”*	**[OP75]**
11:15 – 11:30	**[OP70]** **Dilaycan ÇAM** *“Chemical Composition of Lactarius Salmonicolor Extract Cytotoxic to LNCaP Cancer Cell Lines”*	**[OP73]** **Sema BAĞDAT** *“Magnetic Dispersive Solid Phase Extraction of Chromium and Copper and Determination with Flame Atomic Absorption Spectrometry”*	**[OP76]** **Büşra İPEK** *“Preparation and Investigation of Chitosan Films Incorporated with Bee Bread Extract as An Active Food Packaging Material”*
11:30 – 11:45	**[OP71]** **Filiz KURALAY** *“Polymer-Based Catalytic Motors for Cancer Cell Recognition”*	**[OP74]** **Duygu KARADENİZ** *“Fenton-Like Photocatalytic Dye Degradation with Biopolymeric Matrix without Using H_2O_2”*	**[OP77]** **Talshyn BERDESH** *“Cytotoxic Activity of Lepista Personata (FR.) Cooke Mushroom with Chemical Ingredients”*
12:00 - 12:45	**LUNCH**		
General Session 7	**Chairs: Dr. Antony CALEKERINOS**		
12:50 – 13:30 **[IL13] (Big Hall)**	**Dr. Arunas RAMANAVICIUS** *“Affinity Sensors for The Diagnosis of Covid-19”*		
13:30 – 14:15	**CLOSING CEREMONY**		

Poster Session 1

[PP01] **Kenan DOST** *“Simultaneous Determination of Antibiotics in Chicken Meat by HPLC/UV and Verification by LC-MS/MS”*	**[PP12]** **Bekir SALİH** *“Assessment of Monoclonal Antibody N-Glycan Conformations via a Novel TIMS-HPLC-HILIC-FLD Approach”*	**[PP23]** **Tutku Hazal CANKURTARAN** *“Concurrent Determination of Niacinamide, Dexpanthenol, Phenoxyethanol and Sodium Benzoate in Serum Sample by HPLC-DAD”*
[PP02] **Sławomira SKRZYPEK** *“Lipstick Dyes Analysis - Universal Mobile Phase for TLC”*	**[PP13]** **Müzeyyen MUTİŞ** *“An Eco-Friendly HPLC Method for the Determination of Theophylline in Pharmaceutical Formulations”*	**[PP24]** **Yusuf SICAK** *“Determination of Chemical Profile Contents by HPLC-DAD and GC-MS of Eucalyptus Citriodora Extracts with Different Techniques and Various Solvents and Examination of Their in Vitro Biological Activities”*
[PP03] **Neşet NEŞETOĞLU** *“Identification and Determination of Genotoxic Impurities Using GC-MS and LC-MS/MS”*	**[PP14]** **Emine Kübra İNAL** *“Investigation of the Chemical Profile of Everlasting Flowers by GC-MS After Solid Phase Microextraction”*	**[PP25]** **Yusuf SICAK** *“Determination of Chemical Contents by HPLC-DAD and GC-MS of Centaurea Cyanus L. Extracts and Examination of Antioxidant and Tyrosinase Inhibition Activities”*
[PP04] **Büşra BİRCAN** *“An Experimental Approach for the Headspace Extraction of Limonene from Recycled Polyethylene Plastics”*	**[PP15]** **Emine Kübra İNAL** *“Determination of the Essential Amino Acids Valine, Isoleucine and Tryptophan by HPLC After Derivatization”*	**[PP26]** **Gamze YILDIZ** *“Determination of the Inhibitory Effect of Helichrysum Arenarium L. on Oxidative DNA Base Damage by GC-MS/MS”*
[PP05] **Elif Nilay KAYA** *“Screening of Clove Oil Adulteration by Spectrophotometric and Chromatographic Methods”*	**[PP16]** **Esma SÖYLEMEZ YEŞİLÇİMEN** *“Development and Validation of a Quantitative/Confirmatory Method for the Determination of Eprinomectin Drug Residues in Fish by Liquid Chromatography-Mass Spectrometry”*	**[PP27]** **Beste COŞAR** *“Synthesis of Some Isotopically Labelled Pesticide Compounds and Their Analytical Applications”*
[PP06] **Buket BODUR** *“Estimation of Xylometazoline HCl and Benzalkonium Chloride in Commercial Nasal Spray by Reverse Phase HPLC Assay Method”*	**[PP17]** **Hafsah Mohammed Hussein QABA** *“Quantification of Ellagic Acid and Rutin in Sambucol and Sambucus Black Elderberry Supplements and Certain Foods by HPLC Using A Phenyl Column”*	**[PP28]** **Gamze ERGİN KIZILÇAY** *“A New and Fast HPLC Method for the Determination of Phenoxyethanol in Cream Formulation”*
[PP07] **Alimzhanova MEREKE** *“Determination the Total Petroleum Hydrocarbons in Water Samples by SPME-GC/MS”*	**[PP18]** **Hafsah Mohammed Hussein QABA** *“Determination of Lisinopril Dihydrate by Using Different Analytical Method.”*	**[PP29]** **Elif Mine ÖNCÜ KAYA** *“An Ultrahigh-Performance Liquid Chromatography-Fluorescence Detection (UHPLC-FLD) Method for Simultaneous Determination of Ochratoxin A (Ota),Citrinin (Cit) and Zearalenone (Zea) in Certain Cerealsusing A Core-Shell Biphenyl Column”*
[PP08] **Alimzhanova MEREKE** *“Chromatographic Analysis of Extract of Karatau Eryngium (Eryngium Karatavicum Iljin)”*	**[PP19]** **Ayşenur YALÇIN** *“A New Validated and Stability Indicating Assay Method by HPLC for Combined Hypertension Drug Product: Valsartan and Chlorthalidon”*	**[PP30]** **Murat KEPÜR** *“Determination and Quantification of Nitroso-Arylpiperazine on Quetiapine API with LC-MSMS Application”*
[PP09] **S. Ebru BÜYÜKTUNCEL** *“Determination of the Nucleic Acid Constituents in Edible Mushrooms by Liquid Chromatography”*	**[PP20]** **AYTAJ HUSEYNOVAA** *“Simultaneous Determination of Phenolic Compounds in Ulva Rigida C.Agardh by SPE And HPLC”*	**[PP31]** **Selen AL** *“A New Method for the Therapeutic Drug Monitoring of Citalopram and Escitalopram in Plasma by LC-MS/MS Using SALLME”*
[PP10] **Can Serkan KESKİN** *“Simultaneous Determination of Paracetamol and Chlorzoxazone by Second-Order Derivative Spectrophotometric and RP-HPLC-DAD Methods”*	**[PP21]** **Yasemin ACAR** *“Analytical Method Validation from RP-HPLC To RP-UPLC for Irbesartan, Amlodipine and Hydrochlorothiazide in Pharmaceutical Dosages Form”*	**[PP32]** **Saadet Elif DURAN** *“A Simple, and Reliable RP-HPLC Method for the Determination of Phenyramidol Hydrochloride and Degradation Impurities in Tablet Dosage Form”*
[PP11] **Can Serkan KESKIN** *“Simultaneous Biosorption of Acid Violet and Reactive Yellow Dyes onto Dead Biomass”*	**[PP22]** **Özlem YAZICI** *“Surface Characterization of Agar by Inverse Gas Chromatography”*	**[PP33]** **Hüseyin ALTUNDAĞ** *“Preconcentration of Cobalt and Cadmium Ions with Magnetic Solid Phase Extraction and Determmination by ICP-OES”*

Poster Session 2

[PP34]

Hassan Elzain Hassan AHMED
"Novel Adsorbent $MgAl_2O_4$@$MoSe_2$ for Efficient Solid Phase Microextraction of Bismuth in Preconcentrated Cosmetics, Water, and Food Samples Prior to Analysis Using Flame Atomic Absorption Spectrometry"

[PP35]

Ayşe Nur ÇOBAN
"A New Nanocomposite (ND@CuAl 2 O 4 @HKUST-1) for Micro Solid Phase Extraction of Lead and Cadmium in Food and Legume Samples Prior to the Determination by Flame Atomic Absorption Spectrometer"

[PP36]

Özgür ÖZALP
"Activated Graphite@NiO Nanoflower for Solid-Phase Microextraction of Copper From Environmental Samples and Detection by High-Resolution Continuum Source Flame Atomic Absorption Spectrometry (HR-CS-FAAS)"

[PP37]

[PP38]

Büşra AYDOĞAN
"Development of An Analytical Method for the Simultaneous Determination of Inorganic and Organic Arsenic Species in Food Samples"

[PP39]

İlknur DURUKAN TEMUGE
"Ligandless-Solidified Floating Organic Drop Micro-Extraction Method for the Preconcentration of Trace Amount of Lead and Determination by Flame Atomic Absorption Spectrometry"

[PP40]

Fatma Nur ARSLAN
"Synchronous Fluorescence Spectroscopy Method based on Chemometrics: Quantification of Inexpensive Edible Oil Adulterants in Extra Virgin Olive Oils Harvested in MUT (Mersin) Region"

[PP41]

Fatma Nur ARSLAN
"Cryogen Free 60 MHz ^{1}H–NMR Spectroscopy and Chemometrics for the Authentication of Cold Pressed Black Cumin (Nigella Sativa L.) Seed Oil"

[PP42]

Aynur ŞAHİN
"An Investigation About Removal of Some Heavy Metals from Aqueous Solutions Using Activated Bentonite"

[PP43]

Athanasios VLESSIDIS
"Speciation of Gold Nanoparticles and Total Gold in Environmental Samples by Dispersive Solid Phase Extraction on A Thiol-Functionalized Zirconium(IV) Metal Organic Framework and Determination with Atomic Absorption Spectrometry"

[PP44]

Ayşe ÇETİNTAŞ
"Investigation of the Synthesis of Al_2O_3 Nanoparticle with Myrtus Communis Leaf Extract and the Antibacterial Effect of Deocrem Obtained from $McAl_2O_3$NP"

[PP45]

Bengü Sema MUTAFOĞLU
"Exploration of the Binding of Biscoumarin Derivatives to Bovine Hemoglobin by Molecular Docking and Spectroscopic Methods"

[PP46]

Mehmet Alperen ERGÜN
"Determination of Mercury(II) by Magnetic Solid Phase Extraction Using Fe_3O_4@PPy Nanoparticles with Cold Vapor Atomic Absorption Spectrometry"

[PP47]

Christoforos CHRIMATOPOULOS

"Utilizing ATR-FTIR Spectroscopy Coupled with PCA And PLS-DA to Monitor Athletes' Salivary Profile"

[PP48]

Sinem YETİM
"Identification of Pharmaceutical Ingredients in Raman Spectroscopy"

[PP49]

Ayça BiÇEN İBİK
"Analysis of Photooxidation of Coating By Photoacoustic Fourier Transform Infrared Spectroscopy"

[PP50]

Derya KUTAN
"Development of An ID-ICP-MS Method for Determination of Nd in Waste Printed Circuit Board"

[PP51]

Muhammet UĞAN
"Removal and Enrichment of Pb from Water Sample with Microporous Carbon Spheres, and Determined by Atomic Absorption Spectrometry"

[PP52]

Ezgi GÖNÜL
"Synthesis, Characterization and Analytical Applications of A New Schiff Base ((1E,1'E)-N,N'-(4-Nitro-1,2-Phenylene)Bis(1-(5-Methylthiophen-2-yl)Methanimine) for Metal Determination"

[PP53]

Melike AKDEMİR
"A New Schiff Base (N-(5-Nitro-2-(((Z)-Thiophen-2-Ylmethylene) Amino)Phenyl1-(Thophen-2-Yl)Methanimine) Ligand for Metal Determination:Synthesis, Characterization and Analytical Applications"

[PP54]

Elif KÖSE
"ICP-MS Analysis and Validation by Microwave Digestion System for Determination of Heavy Metals in Allergy and Cancer Drugs Taken Orally"

[PP55]

Yunus ÇETİNTAŞ
"Synthesis of Silver Nanoparticles Using Barberry (Berberis Vulgaris) Roots via Green Synthesis Method and in Vitro Evaluation of Anti-Diabetic Activity"

[PP56]

Fırat AYDIN
"An Analytical Method for the Determination of Cobalt in Wastewater"

[PP57]

Işıl AYDIN
"Determination of Cobalt Content in Rice by Using Magnetic Nanoparticles"

[PP58]

Muhammad Balal ARAIN
"Developed Dispersive Solid Phase Microextraction by Using Novel Material for the Determination of Lead"

[PP59]

Barış YILDIZ
"Preconcentration of Bismuth Using Nickel Hydroxide Nanoflower-based Solid-Phase Extraction from Water Samples and Determination by FAAS"

[PP60]

Özlem ACAR
"Synthesis and Characterization of New Schiff Bases Containing Quinazoline Rings and Their Analytical Applications"

[PP61]

Ece SAĞKOL
"Characterization of UV Absorbers Used in Coatings"

[PP62]

Günseli GÜNEY
"Mg(II) Phthalocyanine Compound Bearing Thiol Units: Examination of Some Properties with UV-Vis Spectroscopy"

[PP63]

Yunus PENLİK
"Investigation of Photochemical Properties of Indium(III) Phthalocyanine Containing Thiol Group Using UV-Vis Spectroscopy"

[PP64]

Nazlı GÜVENÇ YAMAÇ
"The Characterization of Organic based Blocked Acid Catalysts"

[PP65]

Ayşegül ERGENLER
"Genotoxicity Assessment of Carbon Nano Dots Synthesized from Citrus Reticulata"

[PP66]

Gülşen MELTEM
"Synthetic Hyrdroxyapatite Coated with Metal Organic Framework for Removal of Heavy Metal Ions from Environmental Solutions"

Poster Session 3

[PP67]

[PP68]
Neslihan ŞENTÜRK
"3D Printing of Electrodes and Investigation of the Effect of Surface Activation on Surface Properties"

[PP69]
Zeynep İLHAN
"Performance Evaluations of Cataphoresis Coating Thickness After Pre-Treatment on Various Conductive Surfaces"

[PP70]
Ayşe ŞAP
"Determination of Hydroxylamine at Poly-Curcumin-Modified Pencil Graphite Electrode"

[PP71]
Ceren YILDIZ
"Ultra-Sensitive Simultaneous Electrochemical Detection of Zn(II), Cd(II), Pb(II) And Cu(II) in Surface Water and Certified Reference Water Samples"

[PP72]
Buse GENÇDAL
"Extraction of Antioxidants from Black Carrot Pomace by Using Microwave Assisted Extraction and Its Using for Green Synthesis of Silver Nanoparticles"

[PP73]
Pelin SARIBAŞ
"Electrochemical Determination of Antioxidant Gallic Acid based on Metal Nanoparticles Decorated Natural Mineral Using Eco-Friendly Electrochemical Nanosensor"

[PP74]
Teslime ERŞAN
"Cost-Effective and Sensitive Voltammetric Determination of Fenhexamid Used as A Fungicide with A Disposable Pencil Graphite Electrode"

[PP75]
Özge GÖRDÜK
"Selective Amperometric Sensor for Detection of Hydrazine at Gold Nanoparticles Decorated Poly(Brilliant Blue) Modified Electrode"

[PP76]
Ebrar DOKUR
"Preparation of Conductive Ink Containing Nanomaterial and Investigation of Flexible Electrochemical Sensor Properties for Tyrosine Determination"

[PP77]
Ayşe ÇETİNTAŞ
"Evaluation of the Tyrosinase Inhibitory Activity of the Skin Cream Prepared with Walnut Shell, Medicinal Chamomile, Moringa Oil, Arbutin, and Kojic Acid"

[PP78]
Selen URUÇ
"Preparation of Nanoparticle-Based Conductive Ink for Electrochemical Determination of Uric Acid and Investigation of Flexible Sensor Performance"

[PP79]
Rabianur KURTELI
"Preparation of Conductive Ink Containing Metal Nanoparticles/Graphene for Dopamine Determination and Investigation of Flexible Electrochemical Sensor Properties"

[PP80]
Emirhan ARTAR
"Preparation of Conductive Ink Containing Heteroatom Doped Graphene and Flexible Supercapacitor Applications"

[PP81]
Merve YALÇIN AÇIKALIN
"Development of Conductive Polymer based Electrochemical Sensor for the Determination of Vitamin B2"

[PP82]
Özge GÖRDÜK
"Development of Flexible Sensor based on Nanomaterial for Electrochemical Determination of Tyrosine, An Important Biomolecule in Neuroscience"

[PP83]
Selva BİLGE
"SnO_2 Nanoparticles/Recycled Waste Hazelnut Shell Carbon Modified Glassy Carbon Electrode as A Voltammetric Nanosensor for the Sensitive Determination of Phenolic Compound in Biological and Beverage Samples"

[PP84]
Aysu ARMAN
"Well-Dissipated Carbon Nanotubes and Polyelectrolyte based Sensor Electrode Applicationfor Directly Voltammetric Measure of TATP And HMTD"

[PP85]
Şener SAĞLAM
"A New Electrochemical Sensor for the Measurement of Nitroguanidine Employing a Glassy Carbon Electrode Modified with Polyvinylpyrrolidone and Multi-Walled Carbon Nanotubes"

[PP86]
Elif ŞİŞMAN
"Electrochemical Determination of Rosmarinic Acid from Origanum Minutiflorum and Origanum Micranthum Extracts Using Boron-Doped Diamond Electrode"

[PP87]
Fatma MAMATİOĞLU DERİN
"The Effect of Nitroaromatic and Nitramine Type Explosives on the Developed Ammonium Dinitramide Nanosensor"

[PP88]
Yunus ÇETİNTAŞ
"Examination of the Chemical Composition and Anti-Diabetic Activities of Abelmoschus Esculentus, Peganum Harmala, and Aquilaria Agallocha Seed Oils Cultivated in Muğla"

[PP89]
Ümran SOFU
"Electrochemical Analysis of Melatonin on Poly(Bromocresol Purple) Modified Glassy Carbon Electrode and Its Determination from Pharmaceuticals"

[PP90]
Gamze EMİR
"A Self-Powered Enzymatic Glucose Sensor Using Bimetallic Nanoparticles Composites Modified Pencil Graphite Electrodes as Cathode"

[PP91]
Sezgin YAŞA
"Production of A ZnO-based Supercapacitor Electrode Material Recovered from the Ferrochrome Ash Waste"

[PP92]
Furkan Burak ŞEN
"A Novel 1,10-Phenanthroline-based Dual-Functional Antioxidant Capacity Sensor"

[PP93]
Selen AYAZ
"A New Colorimetric Lactate Biosensor based on CUPRAC (Cupric Reducing Antioxidant Capacity) Reagent Using Lactate Oxidase- Pyruvate Oxidase Immobilized Magnetite Nanoparticle"

[PP94]
Seda ŞAHİN
"Determination of Total Antioxidant Capacity Using Modified Electrode"

[PP95]
Müge YERMEYDAN PEKER
"Development of Hydrogel-Based Colorimetric Antioxidant Capacity Sensor"

[PP96]
Ervanur ELMAS
"Cu(II)Nc/Car-MWCNT Modified Electrode for Antioxidant Capacity Measurement"

[PP97]
Özgül VURAL
"Smart and Sensitive Nanomaterial-based Electrochemical Sensor for the Determination of Apoly (ADP-Ribose) Polymerase (PARP) Inhibitor Anticancer Agent"

[PP98]
Şevval SAZLIK
"Electrochemical Determination of Hydroxychloroquine Used in Covid-19 Treatment Using Multiwall Carbon Nanotube Modified Pencil Graphite Electrode"

[PP99]
Sena Ezgi SELÇUK
"Evaluation of Alternative Ways to Analyse Iodine Values of Fats and Oils without Using Carbon Tetrachloride"

Poster Session 4

[PP100] **Hasan ÇABUK** *“Salting-Out Homogenous Liquid-Phase Microextraction For Rapid On-Site Extraction of Aromatic Amines in Environmental Waters”*	**[PP111]** **Nikos LYDAKIS - SIMANTIRIS** *“Impact of Ni(II) on Growth, Metal Uptake, and Lipid Unsaturation of Two Microalgal Species”*	**[PP122]** **Durişehvar ÖZER ÜNAL** *“Why pKa’s Matter in Medicinal Chemistry and A Drug Discovery”*
[PP101] **Karolina CZARNY-KRZYMIŃSKA** *“Removal of Bisphenol Analogues from the Aquatic Environment by Freshwater Microalgae Chlorella Vulgaris”*	**[PP112]** **Onur YAYAYÜRÜK** *“Removal of Methylene Blue Dye Using Poly(Acrylamide) Grafted onto Cross-Linked Poly(4-Vinyl Pyridine) from Waters”*	**[PP123]** **Nur Begüm AKKUŞ** *“Synthesis, Purification and Application of Isotopic Derivatives of Various Antiepileptic and Analgesic Drug Active Substances in Analytical Determination Methods”*
[PP102] **Karolina CZARNY-KRZYMIŃSKA** *“Removal of Selected Bisphenol Analogues by Green Algae Desmodesmus Armatus”*	**[PP113]** **Aslı ERDEM YAYAYÜRÜK** *“Synthesis and Use of Magnetic Amberlite XAD-7HP for the Removal of Methylene Blue from Aqueous Solutions”*	**[PP124]** **Mehrdad RASOOLI** *“Synthesis, Docking Studies and Biological Characterization of Novel Liposomal Imatinib Analogues as Possible Anticancer Agents”*
[PP103]	**[PP114]** **Christoforos CHRIMATOPOULOS** *“Assessment of Water Quality Parameters: A Comparative Study Between Commercially Available Kit and In-House Analysis”*	**[PP125]** **Gülşen MELTEM** *“Modification Hydroxyapatite from Cattle Bones with Biopolymers to Remove Heavy Metal from Environmental Samples and Limit the Biofilm Formation”*
[PP104] **Hamid HASHEMI-MOGHADDAM** *“Synthesis of An Imprinted Polymer for Separation and Colorimetric Determination of Hypoxanthine in Fish Samples as A Freshness Indicator”*	**[PP115]** **Dilek ÖZYURT** *“The Effect of Seasonal Changes on the Phytochemical Analysis of Dominant Macroalgal Species at the Marmara Sea”*	**[PP126]** **Öznur EYİLCİM** *“Synthesis of A New Heterocyclic Molecule That May Be A GSK-3β Inhibitor”*
[PP105]	**[PP116]** **Mehmet ÇETİNKAYA** *“Determination of Spring Waters of Şırnak Province by Analytical Methods”*	**[PP127]** **Lenka KUJOVSKA KRCMOVA** *“Post Covid Syndrome in Patients Hospitalized with SARS-CoV-2 Infection - New Prognostic Markers Evaluation”*
[PP106]	**[PP117]** **Hamid HASHEMI-MOGHADDAM** *“Smartphone-Based Determination of Carbofuran in Fruit Samples by Using Magnetic Molecularly Imprinted Polymer Coated ZIF-8”*	**[PP128]** **Büşra DALGIÇ** *“Synthesis of 4-Ethynylaniline Based Schiff Base, Anion Sensor Properties, Antimicrobial Activity and Interaction with DNA”*
[PP107] **Mehmet KILINÇER** *“Sorption of Vitamin C onto Microplastics”*	**[PP118]** **Neşet NEŞETOĞLU** *“Cleaning Validation of Antineoplastic and Immunosuppressant Agents in Manufacturing Equipment of the Pharmaceutical Industry”*	**[PP129]** **Kristýna MRŠTNÁ** *“Analysis of Lipophilic Vitamin Levels in Hospitalized Patients with Covid-19”*
[PP108] **Mehmet Kılınçer** *“Impact of the In Vitro Human Digestive Environment on the Interaction Between Vitamin C and Microplastics”*	**[PP119]** **Dorota TUROŇOVÁA** *“Neopterin, Kynurenine, and Tryptophan as New Prognostic Markers in Hospitalized Patients with SARS-CoV-2 Infection”*	**[PP130]** **Rukiye AYRANCI** *“Conjugated Polymer based Gold-Nickel Multifunctional Micromotor for Environmental Monitoring”*
[PP109] **Muhammet UĞAN** *“Removal of Textile Dye from Wastewater with Green Chemistry Aspect”*	**[PP120]** **Eylem Funda GÖKTAŞ** *“Study Design for Determination of Drug Substances Stability in Solutions and Biological Samples”*	**[PP131]** **Yeliz KOÇ ERİKAN** *“Increasing the Light Emitting Efficiency of Carbazole and Cholesterol-Derived Molecule Through Molecular Engineering”*
[PP110] **Tuğçe Nur ÖZKARA** *“Effect of Pomegranate Seed Peels as Adsorbent for the Removal of Dyes from Aqueous Solution”*	**[PP121]** **Cansel ÇAKIR** *“The Edible Mushroom, Infundibulicybe Geotropa (Bull.) Harmaja Triggers Apoptosis in Human Colon Cancer (Caco-2) Cell Lines”*	**[PP132]** **Yasemin CÖMERT** *“Investigation of the Effect of Different Design Routes in 3D printing on Electrode Properties”*

Poster Session 5

[PP133] **Mustafa Zafer ÖZEL** *"Green Extraction of Anti-Aging Polyphenols"*	**[PP144]** **Sławomira SKRZYPEK** *"Synthesis and Characterization of Novel Nickel Cobalt Selenide Nano-Moses"*	**[PP155]** **Kader CAN** *"Simple And Rapid Colorimetric Sensing Of Dithiocarbamates Based On Oxidation Of 3,3',5,5'-Tetramethylbenzidine Using Silver Ion"*
[PP134] **Qamar SALAMAT** *"Application of Novel Magnetic Deep Eutectic Solvent@Zn-MOF Nanocomposite for Extraction of Carmoisine Dye from Food and Water Samples Followed by Spectrophotometric Analysis"*	**[PP145]** **Mehmet YAMAN** *"Reduced Graphene Oxide/Epoxy Nanocomposites with Enhanced Mechanical Properties"*	**[PP156]** **Talsyn BERDESH** *"Chemometric Studies on the Aroma Compounds of Honey Samples Produced in Kazakhstan"*
[PP135] **Seda DUMAN** *"A Green Natural Deep Eutectic Solvent based Liquid Phase Microextraction of Rhodamine B Prior to Spectrophotometric Detection"*	**[PP146]** **Muath NJJAR** *"Detection and Removal of Lead by Using Magnetic* CuFe$_2$O$_4$ *Nanoparticles as An Effective Adsorbent from An Aqueous Solution"*	**[PP157]** **Kübra TUNA** *"The Chemical Profile of 15 Turkish Propolis with Chemometric Approach"*
[PP136] **Eda BORA** *"Synthesis of BaTiO 3 @MIL-53 (Al) Composite Material and Its Application to Preconcentration and Separation of Cadmium in Seafoods"*	**[PP147]** **Sevgi KOCAOBA** *"Production and Characterization of Clove Oil-Added Polyvinyl Alcohol/Chitosan-based Antibacterial Nanofibers by Electrospinning Method"*	**[PP158]** **Açelya AKLAN** *"Investigation of the Effect of Cichorium Intybus L. To Prevent Oxidative DNA Base Damage"*
[PP137] **Oğuzhan GÖKTAŞ** *"Determination of Sudan III in Food Samples by UV-Vis Spectrophotometry After Solid Phase Extraction"*	**[PP148]** **Büşra KESKİN ÇEKEM** *"Direct Detection of Peroxide-Type Energetic Material TATP by Nanoparticle Catalysis"*	**[PP159]** **Selen Duygu ÇEÇEN** *"Quainoline based Fluorescence and Colorimetric Sensor for Sequential Detection of Copper (II) And N-Acetyl-L-Cysteine"*
[PP138] **Furkan UZCAN** *"Synthesis of Mxene Sheets as An Effective Adsorbent and Its Use in Dispersive Solid Phase Microextraction for Lead Determination"*	**[PP149]** **Ömer Kaan KOÇ** *"Dual-Functional Heteroatom-Doped Carbon Quantum Dots and Nanocomposite Film for Highly Sensitive Andselective Determination of Picric Acid"*	**[PP160]** **Funda BAYER** *"Synthesis and Photoisomerization Studies of the Conducting Polymer Thin Film Obtained by Symmetric Electroactive Azobenzene Compound"*
[PP139] **Serkan ÇALIŞKAN** *"Different Morphologies of ZnO Microflowers and Their Use in Solid Phase Extraction"*	**[PP150]** **Ziya CAN** *"The Anaesthetic Ketamine Analysis with the Aid of Modified Gold Nanoparticles"*	**[PP161]** **Merve GUZEL** *"Synthesis of "Three-in-One" S-Triazine Cored Monomer: Electrical, Optical and Glucose Sensing Properties"*
[PP140] **Musa YAMAN** *"Extraction of Antioxidants from Turmeric by Using Green Extraction Techniques: Modeling and Optimizing"*	**[PP151]** **Kamila KOSZELSKA** *"New Analytical Approaches based on Catecholamines"*	**[PP162]** **Sadberk SEVME** *"Investigation of the Effect of Natural Antioxidant Additives in PVC Profile Production"*
[PP141] **Ali Mohammednour Ali MOHAMMED** *"A Novel Approach to Cadmium Detection in Water and Food Samples Using* MWCNT@TiSiO$_4$ *Nanocomposite Extraction"*	**[PP152]** **Elif ÜNALDI** *"Schiff Base: Synthesis from Glycine Methyl Ester Hydrochloride, Biological Activity and Anion Sensor Properties"*	**[PP163]** **Koray BİNİCİ** *"Production of Graphene based Polymeric Adsorbent and Removal of Dyes from Wastewaters"*
[PP142] **Fatoş Ayça ÖZDEMİR OLGUN** *"Optimization and Modeling of Ultrasonic-Assisted Extraction of Alpha-Tocopherol from Coconut Oil Using Choline based Deep Eutectic Solvents"*	**[PP153]** **Gökçe ÖRÜNTAŞ** *"Sensitive Reflectometric Determination of Dopamine Using CUPRAC Reagent-Loaded H-PTFE Membrane"*	**[PP164]** **Cem ERKMEN** *"MIPs & Aptamers: Synergistic Effect for the Ultrasensitive Determination of Leptin Using Nanomaterials-Based Voltammetric Sensor"*
[PP143]	**[PP154]** **Aslıhan GÜRBÜZER** *"Development of A Chromatography-based Method for Accurate and Reliable Analysis of Vitamin B12 in Food Supplements"*	**[PP165]** **Mehmet KORKMAZ** *"Anti-Proliferative Effects of New Boron Compounds"*

[IL1]

USE OF MICRO-PLASMAS FOR METAL SPECIATION

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Speciation applications often require the collection of not only elemental but also molecular and structural information. Analytical use of micro plasma based sources enables the direct interrogation of solid, liquid and gaseous samples, multi phase systems with high dissolved material content, often in extreme pH conditions. The robustness exhibited by plasma ion sources offers a unique alternative to conventional electrospray (ESI) / atmospheric pressure chemical ionization (APCI) MS insources which are not able to tolerate these extreme conditions.

In this lecture analytical use of various micro-plasma ion sources will be discussed. Examples of the use of Direct Analysis in Real Time (DART) and Atmospheric Pressure Glow Discharge (APGD) ionization in conjunction with orbitrap mass spectrometry for the detection of organometallic compounds and metal hydrides and intermediates will be presented. Mass spectral behavior including in source fragmentation, adduct formation, oxidization will be discussed.

KEYWORDS: Speciation, DART, APGD, micro plasma, selenium, arsenic

[IL2]

ANALYTICAL CHEMISTRY AND CIRCULAR ECONOMY

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Humanity has been using the concept of "Linear Economy" which can be summarized as "produce-consume-waste". Therefore, our Planet has been spiked with litter for many decades. The only solution to the problem is to apply now "Circular Economy" which is based on the basic principle "produce-consume-recycle". The idea is to reduce or eliminate waste to the Environment.

Analytical Chemistry can play a very important role towards the future development of Circular Economy. We have the knowledge and the instrumentation to isolate, identify and extract beneficial compounds (antioxidants, bioactive, etc) from food waste which can then be re-used.

Examples of Analytical Chemistry on Circular Economy such as date pits [1], potato peels [2], shrimp waste [3] and many others will be presented and discussed.

KEYWORDS: Analytical Chemistry, Circular Economy.

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[IL3]

THE SIGNIFICANCE OF THE RADICAL THEORY OF HYDRIDE ATOMIZATION FOR TRACE ELEMENT ANALYSIS

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In order to develop analytical procedures for trace element analysis based on generation of hydrides coupled to atomic fluorescence (AF) or atomic absorption (AA), it is mandatory to understand the final stage of the whole procedure - atomization/detection. The most popular hydride atomizers for AF and AA spectrometry, respectively, are miniature flames and externally heated quartz tube atomizers (QTA). The key point which must be taken into account in order to understand what really happens in these atomizers is that their temperature is too low to be compatible with any significant thermal atomization of hydrides. The dramatic disagreement with the many years of experience of observing a complete conversion of hydrides to free atoms is explained by the radical theory of hydride atomization. According to this theory, there is a spatially limited cloud of hydrogen radicals (H radicals), created by reactions between oxygen and hydrogen, serving to atomize hydrides. The formed free analyte atoms are stable only in the presence of an excess of H radicals so they start to decay as they are transported beyond the cloud. Consequently, the knowledge of H atom distribution in miniature flames and in QTA is vital for the further development of analytical methods based on HG coupled to AF or AA.

The aim of this presentation is to demonstrate how two different spectrometry methods, two-photon absorption laser-induced fluorescence and selected ion flow tube mass spectrometry confirmed unambiguously for the first time the radical theory and how they can bring important information on H radical distribution and on the mechanism of H radical formation in hydride atomizers and on the decay of free analyte atoms.

KEYWORDS: Atomic fluorescence, atomic absorption, hydride atomization, quartz tube atomizers, miniature flame atomizers.

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[IL4]

RESEARCH PROGRESS IN THE USE AND NEW APPLICATIONS OF MICROEXTRACTION AND SOLID PHASE EXTRACTION FOR WATER AND FOOD ANALYSIS

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The microextraction of organic, inorganic species and nanoparticles from environmental samples has important place for the preconcentration and separation of them prior to their instrumental detection. Solid phase extraction and microextraction are two important techniques at these studies. For solid phase microextraction, the preparation and characterization of novel nanosized material including carbon nanotubes, modified carbon nanotubes, nanocomposites, titanium dioxide nanoparticles and magnetic nanoparticles (MNPs), nanohybrids, nanoflowers etc. which has resistant for acid and bases; high surface area, high adsorption capacity, useable many times without any losses its adsorption properties are very popular recent studies in analytical chemistry. The microextraction techniques are very simple, low the consumption of organic solvents (green), accurate and precise. The use of new generation solvents like deep eutectic solvents (DES) and switchable solvents (SHS) on the microextraction studies is very important for microextraction studies.

The fabrication, characterization and usage of novel nanosized materials for solid phase extraction and solid phase microextraction of organic, inorganic and nanoparticle species for their some applications for food and water samples have been discussed in this presentation.

KEYWORDS: Nanohybrids, nanoflwers, extraction, microextraction, switchable solvents, environmental samples.

[IL5]

ADVANCED MASS SPECTROMETRY IN ELEMENTAL SPECIATION ANALYSIS

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The introduction of hyphenated techniques based on the coupling of a chromatographic separation technique with an element-selective atomic spectrometric was a game-changer in the field of chemical speciation analysis owing to the dramatic decrease of detection limits and increase in molecular specificity based on the retention time matching [1]. Inductively coupled plasma mass spectrometry (ICP MS) in particular, has gained a prominent place as detection technique. In combination with HPLC it allowed a number of exploratory studies for metal species and remains a fundamental technique in the field of metallomics [2]. Recently, the developments in high-resolution Fourier transform mass spectrometry have opened new horizons in studies of metal-binding species. The principal challenge of characterizing metal chelators in real world complex systems is the complexity of the organic mixture and the trace concentrations of specific metal chelates. High-resolution mass spectrometry approaches are able to overcome these issues by resolving molecular features across a large mass range and providing accurate mass information that can be used to identify isotope patterns for elements of interest. The possibility to produce a cascade of product ion mass spectra to at least the MS4 level with the preservation of the isotopic pattern and the sub-ppm mass accuracy largely facilitates the elucidation of structure in de novo identification. There is, however, need for a careful optimization of analytical protocols in order to eliminate (or at least to account for) the formation of artefact metal complexes during chromatography and electrospray ionization. Finally, an additional dimension to speciation analysis has been recently offered by ion-mobility mass spectrometry which is particularly attractive for monoisotopic elements [3]. The lecture discusses the very recent contributions of different state-of the art mass spectrometric techniques (ICP MS/MS, FT MS and ion-mobility mass spectrometry) for speciation analysis in environmental chemistry, nutrition and life-sciences.

KEYWORDS: Metals, speciation, metallomics, mass spectrometry, coupled techniques

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[IL6]

EXPLORING THE CHEMICAL UNIVERSE OF ENVIRONMENTAL SAMPLES THROUGH CUTTING-EDGE ANALYTICAL METHODOLOGIES AND ADVANCED CHEMOMETRIC TECHNIQUES

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Thousands of chemicals are released daily into the environment, posing a potential threat to the ecosystem and human health. The latest advances in high resolution mass spectrometry (HRMS), as well as advancements in software for data treatment and data evaluation have enabled the comprehensive monitoring of a diverse group of contaminants in complex matrices.

The Laboratory of Analytical Chemistry at the National and Kapodistrian University of Athens has been at the forefront of developing advanced analytical methodologies and chemometric tools to explore the chemical universe of environmental samples. LC-ESI (both RPLC and HILIC) and GC-APCI- HRMS methodologies and workflows (wide-scope target, suspect and non-target screening) have been developed for the determination of known contaminants and the identification of unknowns. Datasets of more than 2,400 organic pollutants, including compounds of different classes and their transformation products, have been developed for target screening purposes, whereas sophisticated software and chemometric tools have been developed, as supporting suspect and non-target tools [1-4]. Recently, the integration of ion mobility-derived CCS values with TIMS technology into LC-QTOFMS provided higher sensitivity and enhanced confidence in contaminants' detection at trace-levels. The combination of targeted and untargeted HRMS workflows has been implemented in numerus environmental monitoring studies worldwide, including investigations in the Danube River and the Black Sea [5,6], and wastewater epidemiology studies [7].

KEYWORDS: High Resolution Mass Spectrometry, Untargeted workflows, Environmental monitoring, Emerging contaminants

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[IL7]

ADVANCED OXIDATION PROCESSES FOR WATER PURIFICATION FROM CYANOTOXINS AND TASTE & ODOR COMPOUNDS

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Cyanobacteria are photosynthetic microorganisms found in surface waters, which under favorable conditions (light, temperature, nutrients) can grow massively to form surface “blooms” or benthic “mats”. Occurrence of cyanobacteria blooms is expected to increase globally with climate change. Some cyanobacteria species produce secondary metabolites that are potent toxins, called cyanotoxins (CTs), commonly found in freshwaters all around the world. A wide range of (semi)volatile metabolites are also produced in natural waters by prokaryotic and eukaryotic microorganisms commonly known as “algae”, or by fungi and actinomycetes. This “volatilome” includes several compounds having characteristic strong odors, called water Taste & Odor compounds (T&O). Some T&O are detectable by the human nose at extremely low concentrations (e.g. low ng/L), thus they are a frequent cause of drinking water consumer complaints. CTs and T&O are nowadays considered as major threats for water quality, public health, aquatic ecosystems, and tourism. The increasing occurrence of such emerging pollutants has recharged the interest in Advanced Oxidation Processes (AOPs) that are commonly based on the generation of Reactive Oxygen Species (ROS), as alternatives for water treatment. Large knowledge gaps exist with regards to ROS-driven reaction pathways and transformation products (TPs) of CTs and T&O. The presentation will cover examples on heterogeneous AOPs such as photocatalysis (UV/TiO_2, UV/polyoxometalates) and homogenous AOPs that are promising for real applications, e.g., UV/Cl_2, UV/H_2O_2 and sonolysis as well [1,2]. Special focus will be given on the elucidation of the primary molecular-level interactions and reaction mechanisms of ROS with less-studied CTs and T&O that represent a range of chemical groups, toxicity modes and sensory characteristics. New TPs have been identified. EPR using spin traps as well as scavengers and molecular probes has been applied to study the primary reactive species under various experimental conditions. Steady-state γ-radiolysis has also been used as a new tool to study ROS and their reaction pathways with CTs and T&O [3]. An integrated set of advanced analytical workflows including LC-HRMS, LC-MS/MS, GC-MS/MS has been applied for monitoring of target pollutants degradation and identification of intermediate and final products. Overall, despite the operational challenges, AOPs are anticipated to have significant impacts across various domains, including fundamental research, public health, environmental conservation, EU policy implementation, and the water technology sector.

KEYWORDS: Advanced Oxidation Processes, cyanotoxins, water taste and odor compounds, reactive oxygen species.

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[IL8]

AN OVERVIEW OF ADVANCED ANALYTICAL TECHNIQUES USED IN NANOMATERIAL CHARACTERIZATION WITH THE CASE STUDIES

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Interest in nanomaterials has grown exponentially over the past several decades due to their unique electronic, optical, physical, and chemical properties compared to traditional bulk materials [1]. For this reason, in recent years, many researchers from various disciplines, including the Analytical Chemistry community, have been making great investments in the synthesis and applications of various nanomaterials [2]. Besides the necessity of rational design and synthesis of nanomaterials for targeted applications, adequate characterization of nanomaterials is essential to verify the identity and properties of these materials in various fields. Characterization of nanomaterials is a challenging task involving the systematic investigation of their properties/structure relationship at the nanoscale, which is essential for understanding their behavior and for tailoring them for various applications [3]. However, traditional instrumental techniques used in the characterization of macro/micromaterials are not sufficient for the characterization of nanomaterials. To understand the properties and behavior of nanomaterials in complex mediums, enabling their diverse applications across various fields including nanoelectronics, nanomedicine, and materials science, advanced analytical techniques are required, as they provide valuable insights into their structural, chemical, and physical properties at the nanoscale. In this presentation, I will make an brief overview about the theories of advanced instrumental techniques used in nanomaterial characterization including transmission electron microscope (TEM), scanning electron microscope (SEM), atomic force microscope (AFM), X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), X-ray fluorescence (XRF), Raman spectroscopy, dynamic light scattering (DLS), and Nitrogen adsorption-desorption (BET analysis) by giving several case studies from our own research or the ones from the literature for each of them. I believe that my presentation will give insights to participants about choosing appropriate advanced instrumental technique for characterizing each specific type of nanomaterials using in their research and to interpret the data obtained by such techniques.

KEYWORDS: Nanomaterials, characterization, advanced instrumental techniques, electron microscopy, X-ray techniques, spectroscopy.

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[IL9]

RECENT DEVELOPMENTS IN THE DETERMINATION OF ANTIOXIDANT ACTIVITY AND OXIDATIVE STATUS USING SPECTROSCOPIC AND ELECTROANALYTICAL METHODS, ALSO INCORPORATING NANOTECHNOLOGY

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Measuring the total antioxidant capacity (TAC) or antioxidant activity levels of biological fluids and foods is carried out for the diagnosis and treatment of oxidative stress‒associated diseases in clinical biochemistry, for meaningful comparison of foods in regard to their antioxidant content, and for controlling variations within or between products. Measuring plasma TAC may help evaluating the physiological, environmental, and nutritional factors of the redox status in humans. Each assay having a distinct redox potential, solvent dependence and kinetics plays its own meaningful role in the detection/quantification of different types of antioxidants in various matrices, stimulating the need to develop such assays. In this regard, the development and modification of antioxidant assays in our laboratories, namely CUPRAC (CUPric Reducing Antioxidant Capacity) [1], CERAC (Ce(IV) Reducing Antioxidant Capacity), ferric ferricyanide, and reactive species scavenging assays will be summarized. A colorimetric sensor for the simultaneous determination of oxidative status and antioxidant activity on the same membrane: N,N-dimethyl-*p*-phenylene diamine (DMPD) on Nafion, was developed. The advantages/disadvantages of the developed/modified methods compared to those of other electron-transfer (ET)-based (e.g., FRAP and Folin), hydrogen atom transfer (HAT)-based assays like ORAC, and mixed-mode (ET/HAT) assays (e.g., ABTS and DPPH) will be evaluated. The CUPRAC assay has been further modified to fit the needs of scavenging activity determinations of reactive oxygen and nitrogen species (RONS) such as hydrogen peroxide, superoxide anion and hydroxyl radicals, where either the original probe or the converted product had CUPRAC reactivity. Protein thiols could be measured with a modified CUPRAC method using a urea buffer. Two low-cost colorimetric TAC sensor (CUPRAC sensors) were developed by immobilizing the Cu(II)-Nc reagent onto a perfluorosulfonate Nafion membrane. An on-line HPLC-CUPRAC method was developed for the selective determination of polyphenols in complex plant matrices. Electrochemical CUPRAC assays were applied to modified electrodes by measuring both Cu(II)-Cu(I) reduction current and Cu(I)-Cu(II) oxidation current in the presence of neocuproine. CUPRAC was applied to oxidase enzyme substrates by measuring the H_2O_2 produced from the immobilized enzyme-substrate reaction [2], and indirectly to pesticide determinations *via* enzyme inhibition. More than expected from a TAC assay, the CUPRAC method has evolved into an integrated series of measurements for antioxidant characterization, oxidative stress assessment, and enzyme-substrate reactions. Recently, determination of primary and secondary oxidation products in vegetable oils with a novel gold nanoparticles-based fluorometric turn-on nanosensor was accomplished and a new total oxidation value for edible oils was proposed [3].

KEYWORDS: Antioxidant activity/capacity, oxidative status, reactive oxygen/nitrogen species (RONS), spectroscopic sensors.

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[IL10]

FoodOmicsGR_RI: GREEK NATIONAL RESEARCH INFRASTRUCTURE FOR THE COMPREHENSIVE CHARACTERIZATION OF FOODS

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Foodomics combines food and nutrition sciences with advanced analytical techniques and bioinformatics, in a hypothesis-free approach toward characterization of the food composition or food consumers' biofluids. Foodomics, addresses scientific challenges such as food authentication, traceability, improvement of food produce, food quality and nutritional value. This holistic approach employs cutting-edge technologies and big data. New knowledge is generated, highlighting previously unknown associations of biomolecules with the studied phenotype.

FoodOmicsGR_RI is a national research infrastructure that aims to perform and aid omics research in agri-food sector in the Greek research environment. This field is of high importance for the country and its agriculture and primary sector. Because of the unique landscape Greece exhibits a diverse and rich portfolio of local/national products and foods. Therefore, the central scope of FoodOmicsGR_RI is to support the Greek agri-food sector by generating robust data on the composition and nutritional value of the local produce, thereby increasing product's position, market demand and provide a higher revenue for the producers. The infrastructure comprises eight (8) Greek Universities and Research Centers. Analytical groups and food specialist groups comprise a team of 80 staff and newly recruited researchers from 20 scientific disciplines. Our work included the establishment of FoodOmicsGR food database, a public searchable database with more than 18000 entries, with concentration values for ca 900 metabolites found in 26 Greek foods. We will also present our results on the development of LC-MS methods for the characterization, mapping and classification of Greek foods. Finally, we will briefly discuss application of the technology in the study of diet and nutrition and their impact in health and wellness [1].

KEYWORDS: metabolomics, foodomics, food authenticity, LC-MS.

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[IL11]

VACUUM-ASSISTED HEADSPACE MICROEXTRACTION: FROM THEORY TO A NEW PRODUCT

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The effect of vacuum sampling emerged as a new experimental parameter to control and exploit during headspace microextraction [1]. The positive effect of reduced pressure sampling was initially reported for headspace solid-phase microextraction (Vac-HS-SPME), and the theoretical studies brought new insights on the processes underlying SPME sampling. At the same time, resulting methods were always found to yield high extraction efficiencies and very good sensitivities within short sampling times and at mild temperatures. The applicability of vacuum sampling was recently extended to microextraction methods that make use of high-capacity extraction phases, such as single-drop microextraction methodology, sorptive extraction using coated stir-bars marketed under the name, Twister™ and thin-film microextraction [2]. This contribution also extends the applicability of the vacuum approach to SPME Arrow during the headspace sampling from honey samples. In all cases, conducting pre-equilibrium analyte sampling under vacuum resulted in a net improvement in extraction efficiency, and confirmed theoretical predictions stating that vacuum sampling not only accelerates the volatilization step but also analyte uptake by these high-capacity extraction phases.

The vacuum approach is disruptive by nature and over the past ten years an innovation strategy was adopted to transform the “theory” into a new product. In 2023, we were successful in the commercialization of a series of new products and methods. Catalyzing innovation in sample preparation is critical to circumvent current lock-ins in traditional and harmful sample preparation methods. The commercialization of “safer” sample preparation products and approaches that reduce the environmental impact of analytical practices is directly related in delivering sustainability in sample preparation. It is equally important that the the co-evolution of academia, companies, and society will lead to the systemic change needed for implementing circular analytical chemistry, a current rend aiming to improve resource efficiency and reduce the environmental impact of analytical chemistry activities.

KEYWORDS: Sample preparation, microextraction, innovation, vacuum headspace sampling.

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[IL12]

ENDOCRINE DISRUPTOR COMPOUNDS: THEIR TREATMENT AND DETERMINATION STRATEGIES IN ENVIRONMENTAL SAMPLES

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Endocrine disrupting compounds (EDCs) are a diverse group of chemicals that cause adverse effects on human and wildlife health by interfering with the endocrine system. EDCs encompass a wide range of natural and synthetic compounds, including herbicides, pesticides, industrial chemicals, plasticisers, food additives, personal care products and pharmaceuticals. The ability to mimic or disrupt hormonal functions within the endocrine system is a source of concern due to its potential impact on reproductive, developmental, and metabolic health. A critical aspect of managing the risks associated with EDCs is to understand their sources, exposure pathways and potential health effects. Treatment strategies for EDCs are multifaceted and include physical, chemical, and biological processes. Strategies for the removal of EDCs use treatment methods such as adsorption, electro-oxidation, Fenton, photo-oxidation, classical activated sludge systems and membrane bioreactors. Analytical methods play a key role in the detection and quantification of different EDCs. Gas chromatography, liquid chromatography, mass spectrometry and immunoassays are some of the widely used techniques to identify these compounds in different matrices such as environmental samples, food and biological tissues. Accurate and sensitive analytical techniques are essential to assess the levels of EDCs in environmental samples and to understand their persistence and bioaccumulation. This abstract provides an overview of the potential adverse effects of EDCs, the various techniques for their removal from water and wastewater, and the analytical methods used to identify and quantify these chemicals.

[IL13]

AFFINITY SENSORS FOR THE DIAGNOSIS OF COVID-19

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Conducting polymers are synthesized by electrochemical [1], chemical [2] and biochemical [3-5] methods. The applicability of differently formed conducting polymer layers in the design of several types of affinity sensors will be addressed [6,7]. Significant attention will be paid for the design of electrochemical affinity sensors based on electrochemically generated polymers [1]. Polypyrrole is biocompatible conducting polymer, therefore, it can be successfully applied for the immobilization of biomaterials, for this reason, it is the most frequently applied in the design of sensors and especially affinity-sensors. Electrochemically deposited polypyrrole is suitable for the design of molecularly imprinted polymers (MIPs) that can be applied for the determination of biologically active molecules. We have synthesized polypyrrole-based molecularly imprinted structures and applied these polymeric structures in affinity sensors for the determination of SARS-CoV-2 proteins. The formation of conducting polymer based MIPs layers by electrochemical methods will be presented [6]. Significant attention will be dedicated to improvements, which are provided by overoxidation of polypyrrole. Advantages of molecularly imprinted conducting polymers in comparison to some other types of conducting polymers will be outlined [7]. Some future trends in formation and application of conducting polymers will be discussed.

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KEYWORDS: Conducting polymers, Polypyrrole, Polyaniline, Immunosensors, Molecularly imprinted polymers, Biosensors; Bioelectronics.

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[OP1]

DUAL-FUNCTION ANTIOXIDANT CAPACITY MEASUREMENT USING A SINGLE CHROMOGENIC REAGENT

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Reactive oxygen, nitrogen species (ROS, RNS), and free radicals are formed in living organisms. When radicals are not balanced with antioxidants, oxidative stress occurs. The main way to combat reactive species is to consume foods rich in antioxidants, and therefore antioxidant capacity assessment is of great importance in different fields such as biochemistry and medicine, as well as food science [1]. In this study, a simple and sensitive dual-mode method, both fluorometric and spectrophotometric, was developed for the determination of total antioxidant capacity by obtaining a cupric complex formed from a chromogenic reagent with both fluorescence and chelating properties. In the fluorometric method, a linear decrease in cupric complex fluorescence was observed depending on the antioxidant concentration. In the spectrophotometric method, the absorbance change of the reduced cupric complex formed in the presence of antioxidants was observed. After optimizing working conditions, calibration equations were obtained by applying the methods separately to standard antioxidant compounds, and Trolox equivalent antioxidant capacity (TEAC) values were calculated. Known amounts of antioxidants were added to tea infusions and the precision and recovery of the proposed method were examined. Then, the method was applied to synthetic antioxidant mixtures and compared in terms of TEAC values found experimentally and expected by calculation. Finally, the total antioxidant capacity values of real food extracts were validated by comparing them with the results of the CUPRAC method.

KEYWORDS: Antioxidant capacity, cupric complex, food extracts, spectrophotometry, fluorometry.

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[OP2]

DETERMINATION OF PHENOLIC CONTENTS, ANTIOXIDANT ACTIVITY AND TYROSINASE INHIBITION OF *FICUS CARICA* LEAF EXTRACTS

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Fig (*Ficus carica*), have grown as subtropical plants, more than 800 trees and shrubs in various regions of the world. It is one of the oldest known cultivated plants belonging to the Moraceae family found in the region [1]**.** Figs began to be grown 3000 years ago in the southern parts of the Arabian Peninsula. It has spread to Mediterranean countries as well as Iraq, Turkey, and Syria. It is known that fig leaves are used to treat many diseases such as dermatological. So, it is known to consist of various bioactive compounds, such as chlorogenic acid, rutin, luteolin, and (+)-catechin in the peel, flesh, leaves, and fruits of fig [2,3]. *Ficus carica* leaves were collected in April and November from Dalaman-Muğla. Eight extracts were obtained: ethyl acetate, methanol, aqueous ethanol, and water extract. Phenolic content analyzes were performed by comparing all the obtained extracts with 41 standard substances with the HPLD-DAD device. The antioxidant activities of *Ficus carica* extracts were determined by DPPH radical removal and ABTS cation removal activity, CUPRAC activity method, and *β*-carotene-linoleic acid color bleaching activity methods, as spectroscopic and *in vitro*. The tyrosinase inhibition activity assay of 8 extracts of 4 different polarities from *Ficus carica* leaves was performed. As a result, in this study, the phenolic content and tyrosinase enzyme activity of *Ficus carica* leaves collected from Dalaman in two different seasons were compared for the first time. According to the results, it was found that the tyrosinase enzyme activities of the extracts obtained in November were higher. The extracts obtained in November showed activity close to kojic acid used as the standard substance.

KEYWORDS: *Ficus carica*, antioxidant activity, tyrosinase activity, HPLC-DAD.

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[OP3]

EVALUATION OF ANTIOXIDANT ACTIVITY AND TOTAL PHENOLIC CONTENTS IN ANATOLIAN ROYAL JELLIES

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Free radical formation in cells increases in stressful environments and unhealthy diets. Oxidation of free radicals produces oxidative stress, and this leads to enzyme deactivation, lipid peroxidation and ageing. Antioxidants protect living organisms from oxidative damage, preventing various diseases such as cancer, cardiovascular diseases and diabetes. Therefore, the presence of protective agents against free radicals and other oxidants in living cells is very important, and there is a great demand for natural products with antioxidant activity. Bee products are also known for their high antioxidant content. One of these, royal jelly, is a creamy-white viscous substance that is secreted from the hypopharyngeal (throat) and mandibular (lower jaw) glands of worker honey bees and is the essential nutrient for the larvae of the queen bee. Royal jelly has high nutritional value due to its various amino acids, enzymes, proteins, vitamins and peptide contents. It is used not only as food but also for therapeutic purposes due to its positive effects on health. So, its scientific and commercial value has increased rapidly in recent years. Anatolia, which has a rich flora due to its rich plant diversity, is home to royal jelly, as well as many other bee products [1-3].

In this study, the antioxidant activities of 15 royal jelly samples collected from Amasya, Ordu, Kastamonu, Gaziantep, Kırklareli, Çanakkale, Bilecik, Elazığ, Iğdır, Bingöl, Konya, Karaman, Çankırı provinces were determined by total phenolic contents (TPC), ferric reducing antioxidant power (FRAP) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) inhibition assays. In TPC analysis, the amount of reduction of Folin-Ciocalteu (FC) reagent by antioxidants was measured. In the DPPH test, radical scavenging activity based on the inhibition of the DPPH radical with antioxidants was measured. For FRAP analysis, the amount of reduction of Fe^{+3} to Fe^{+2} by tripyridyl triazine (TPTZ) complex under the influence of antioxidants was measured. Spectrophotometric analysis was used in the tests.

KEYWORDS: Bee, royal jelly, antioxidants, bioactivity, phenolic compounds, spectrophotometry.

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[OP4]

SYNTHESIS, CHARACTERIZATION AND PHOTOCATALYTIC DYE DEGRADATION ACTIVITY OF THE TERNARY COMPOSITE COMPOSED OF CERIUM OXIDE NANOPARTICLES, GRAPHENE OXIDE AND POLYACRYLAMIDE

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Effluents containing reactive dyes from various industries can be a major threat to the environment and water supplies. Thus, there has been an increasing attention of many researchers to decontaminate the water from dyes. Various physical methods such as adsorption, ion exchange, and filtration/coagulation methods have been implemented to remove dyes while chemical methods include ozonization and photocatalytic reactions. Among these techniques, the photocatalytic process has several advantages over other methods. Since it degrades pollutants almost completely and no secondary pollution occurs, the photocatalysis process seems to be more environmentally friendly.

Semiconductors have great potential to contribute to photocatalytic processes. Cerium oxide nanoparticles (CeO_2-NPs) as a semiconductor material, are efficient photocatalysts because they provide photo-generated holes with high oxidizing power due to their wide band gap energy [1]. On the other hand, graphene oxide (GO) has also been taken attention due to its easily tunable band gap in photocatalytic applications. As an electron acceptor, it helps in the transfer of photoexcited electrons from the CeO_2 conduction band to GO. This could lead to a synergetic effect on the photocatalytic degradation process. In this study, CeO_2-NPs and GO were chosen for the efficient photodegradation of methylene blue dye. CeO_2 and GO were entrapped in acrylamide and easily removed from the water after photodegradation.

The ternary composite material of CeO_2-NPs/GO/PAM hydrogel was synthesized and characterized by X-ray diffraction, Fourier transform infrared spectroscopy, scanning electron microscopy, and energy-dispersive X-ray spectroscopy techniques and applied for the photocatalytic degradation of methylene blue (MB) dye from an aqueous solution [2]. In order to obtain the highest dye degradation percentage in the shortest time, the amounts of CeO_2-NPs and GO, pH, initial MB concentration, type of light irradiation, and contact time have been optimized. The prepared hydrogel under UV-A light irradiation had the highest photocatalytic activity by 90% in 90 min. Total organic carbon (TOC) and chemical oxygen demand (COD) were also evaluated. Moreover, the reusability tests showed that CeO_2-NPs/GO/PAM hydrogel has good stability and is active even up to the ninth use.

KEYWORDS: Nanoceria, wastewater, dye removal, hydrogel, photocatalysis

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[OP5]

REMOVAL OF FLUORIDE IONS FROM WATER BY CERIUM OXIDE NANOPARTICLES DOPED CERIUM-CARBOXYMETHYL CELLULOSE: OPTIMIZATION, ADSORPTION ISOTHERM AND KINETIC STUDIES

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Worldwide contamination of water by fluoride has been the main environmental concern. While the presence of low content of fluoride ions in drinking water is necessary for health, exceeding certain limits causes fluoride-related health problems, such as dental and skeletal fluorosis and neurological impairment. The adsorption method for removing fluoride ions from water is the most preferred method due to its ease of use and economy, and studies focus on the development of effective new types of adsorbents [1]. Previously, among various adsorbents, biopolymer-based adsorbents have been found to be successful in the removal of fluoride from water [2,3]. Nanometal oxides are good adsorbent candidates due to their very large surface area. However, the recovery of nanoparticles from water is an additional problem. Entrapment of nanoparticles in polymeric materials solves this problem. In the present study, a novel adsorbent for fluoride ions was prepared by entrapping CeO_2 nanoparticles in a non-toxic and biodegradable biopolymer, carboxymethyl cellulose (CMC), and furthermore, by cross-linking CMC with cerium ions. To determine the most efficient experimental conditions, the effects of variables, such as pH, initial fluoride concentration, amount of adsorbent, shaking rate, and time, on adsorption were investigated using the batch method. It was observed that the best removal was achieved by CeO_2-Ce-CMC bead adsorbent with ~100% yield within 120 minutes. From the Langmuir isotherm model, it was found that the adsorption capacity of CMC adsorbent cross-linked with Ce ions, which was 105 mg F^-/g adsorbent, increased significantly with the contribution of CeO_2-NPs and reached 312 mg F^-/g adsorbent [4]. The adsorption kinetic modeling showed that the adsorption kinetics followed the pseudo-second-order kinetic model.

KEYWORDS: Biopolymer, removal, modeling.

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[OP6]

THE INVESTIGATION OF SURVIVABILITY AND BIOACCUMULATION OF THE ZINC SULPHUR-NPS ON GAMMARUS PULEX

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Zinc is generally found in the earth's crust in oxidized, silicate, carbonate, sulfide and native form in nature. Sphalerite, whose compound formula is ZnS, contains 67% Zinc, 33% Sulfur. ZnS-NPs were used successfully in many applications such as light emitting diodes, solar panels, bio-imaging, flat panel displays, wavelength-tunable lasers, electroluminescent devices, infrared detectors, electronic and optoelectronic nanodevices [1]. This common usage area and the existence of common and successful synthesis methods have gradually increased the use of ZnS-NPs. With the increasing usage rate, the accumulation of ZnS-NPs in nature increases with process wastes during the disposal and production of electronic devices containing ZnS-NPs. Gammarus pulex (L., 1758) are very important members of the aquatic system's food chain and they can be easily used in experimental studies and are important biomarkers because of their metal-accumulating abilities [2]. This study was aimed to investigate the lethal and sublethal toxicity, survival rates, and the bioaccumulation of the ZnS-NPs on Gammarus pulex. Within the scope of the study, zinc acetate and sodium sulfur were used as the basic starting material in the synthesis of ZnS. Chemical and structural analysis of ZnS structures synthesized within the scope of the study were determined by FTIR and XRD spectroscopy. The temperature, pH and dissolved oxygen values of the water were measured at daily. For toxicity tests, 100 mg/L stock Zinc Sulphur-NPs solution (Zinc Sulphur) was freshly prepared. Gammarus pulex samples for the bioaccumulation analysis were collected at 24, 48, 72, and 96 hours. It was sampled 5 animals in per test chambers at every day. After digestion of gammarid samples (CEM, MW), the flame atomic absorption spectrophotometry (FAAS) device was used for the Zn bioaccumulation analysis. After the acute 96 hours experiment, while the LC50 value was determined 3.39 (2.79-4.17) mg/L, it was found that both the toxicity and the accumulation levels in tissues of the ZnS-NPs increased with an increasing exposure time and doses. At the end of this study, it was determined that the Zinc Sulphur-NPs was highly toxic after 3.5 mg/L and even the smallest doses of it can accumulate in the tissues of Gammarus pulex. The accumulation of ZnS-NPs at the tissues of secondary consumers and primary consumers such as gammarus in the trophic pyramid can cause major hazardous in terms of the health of the aquatic environment. Therefore, the bioaccumulation study will make important contributions to the risk assessment of aquatic environment.

KEYWORDS: Zinc Sulphur nanoparticles, *Gammarus pulex*, bioaccumulation, aquatic ecotoxicology

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[OP7]

THE COHORT OF CONCERN COMPOUNDS: A NEW ERA IN THE FUTURE OF PHARMACEUTICALS AND DRUG DEVELOPMENT

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Nitrosamines are potentially carcinogenic organic compounds that contain a nitroso-functional group. They are widely found at trace levels in different kinds of foods, water, air and medicinal products. The occurrence of nitrosamine in various drug substances has raised safety concerns regarding the use of these contaminated medicinal products [1]. Nitrosamine can be generated at any stage of the drug substance synthesis because of the reaction of a nitrosating agent with a secondary or tertiary amine group under certain conditions [2]. Consequently, drug regulatory authorities all over the world have established strict guidelines and policies for the regulation and minimization of nitrosamine levels in all the produced drug products. In this paper, an overview of the nitrosamine occurrence in the drug products was presented. Their different sources, carcinogenic effects and classification based on their carcinogenic potential were summarized. Besides, this paper aimed to underline the importance of the analytical methods used for the qualification and quantification of the nitrosamine levels in active pharmaceutical ingredients (API) and finished products (FP). In this context, currently used extraction methods and high-tech analytical instrument principles were presented. Finally, some of the available challenges were mentioned to open a new window for new ideas and research perspectives concerning this topic.

KEYWORDS: Nitrosamine, drug products, analytical methods, analytical instruments.

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[OP8]

ISOMERIC ANALYSIS OF DRUG MOLECULES USING TRAPPED ION MOBILITY-MASS SPECTROMETRY TECHNIQUE

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Various analytical techniques are used in the determination of isomeric species found in pharmaceutical ingredients. In many of these analytical approaches, isomers can be separately identified through pre-separation processes such as chromatography or electrophoresis. In isomer identification studies, in addition to the separation methods mentioned, ion mobility spectrometry (IMS) can also be employed to separate species in the gas phase based on their charges and shapes. The combination of mass spectrometry, which is one of the most important analytical systems that allows for high sensitivity, accuracy, and precision with ion mobility spectrometry (IMS), results in a powerful analytical technique called ion mobility-mass spectrometry (IM-MS) for the analysis of isomeric species. In this study, the proton pump inhibitors, namely lansoprazole, pantoprazole, and rabeprazole, were analyzed using trapped ion mobility spectrometry-time-of-flight-mass spectrometry (TIMS-TOF-MS) technique. Initially, the analysis method parameters were optimized to achieve high resolution of isomers based on their conformational characteristics using ion mobility technique. The aim of this study was primarily to develop IM-MS-based analytical methods that enable the direct analysis of drug samples without the need for any pre-separation processes or columns, and with significantly shorter analysis times. In the presence of different salts (trifluoroacetate salts of sodium, potassium, and silver) the same collision cross section values were calculated for identical ions. This shows that the analytical method applied in the scope of the study is consistent. According to the data obtained from the IM-MS and IM-MS/MS analyses, it was observed that the sodium, potassium, and silver adducts of the drug molecules, exhibited multiple conformations, including the possibility of monomer and dimer formation, and the stabilities of these structures were compared.

KEYWORDS: Mass Spectrometry, Trapped Ion Mobility Spectrometry-Time-of-Flight-Mass Spectrometry (TIMS-TOF-MS), Tandem Mass Spectrometry (MS/MS), Proton Pump Inhibitors

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[OP9]

ELECTROCHEMICAL SENSING OF A NOVEL TYROSINE KINASE INHIBITOR

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Ponatinib (*PON*) is an innovative tyrosine kinase inhibitor (TKI) that entered the market in 2016. It plays a crucial role in the treatment of chronic myeloid leukemia and also Philadelphia chromosome-positive acute lymphoblastic leukemia, particularly with acquired T3151-mutant BCR-ABL, which confers absolute resistance to other tyrosine kinase inhibitors. It is worth noting that *PON* treatment has been associated with various adverse effects, including skin rashes, elevated lipase levels, hypertension, and, in severe cases, vascular complications [1,2].

Numerous methods for quantifying different TKIs have been developed based on existing literature data [3,4]. However, as far as our knowledge extends, no study has so far demonstrated the electrochemical properties and voltammetric determination of *PON*. Consequently, in the current study, electrochemical techniques are applied for the development of a simple methodology for quantitative determination of *PON*, and also for the characteristic of the interaction occurring between this drug and dsDNA. All voltammetric experiments were carried out using square-wave voltammetry and cyclic voltammetry, employing a boron-doped diamond electrode (BDDE) as a working electrode. The electrochemical behavior of *PON* was investigated in a broad pH range. The influence of various factors such as SW parameters was also studied. Linearity of peak current on concentration of ponatinib was found in the range from 1.0 to 20.0 µM with a detection limit of 0.25 µM.

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KEYWORDS: ponatinib, voltammetry, tyrosine kinase inhibitor, drug

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[OP10]

EFFICIENT DISPERSIVE SOLID-PHASE MICROEXTRACTION OF THREE TRIAZOLE FUNGICIDES FROM FRUIT JUICES AND WATER SAMPLES USING A Ni-Co MOF/ Zn-NTA NANOFLOWERS HYBRID COMPOSITE

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A convenient and sensitive method for the trace detection of triazole fungicides preferred difenoconazole, hexaconazole, and triticonazole in environmental water and fruit juices has been analyzed by developing combining dispersive solid-phase microextraction (d-SPME) and high-performance liquid chromatography with a diode array detector (HPLC-DAD). To effectively extract triazoles, Ni-Co MOF (metal-organic frameworks) /Zn-NTA (nitrilotriacetic acid) nanoflowers were synthesized, then characterized by FT-IR, XRD, FE-SEM, SEM-EDX methods and used as the extraction phase of SPME. A number of basic extraction parameters such as pH of the sample matrix, amount of adsorbent, adsorption and desorption time, adsorption capacity, sample volume, matrix effect, eluent type, and volume were optimized [1-2]. Ni-Co MOF/Zn-NTA nanoflowers based d-SPME/ HPLC-DAD method developed under optimum conditions (flow rate, 1.0 mL min^{-1}; desorption solvent, ACN/ammonia mixture (95/5, v/v); sample pH value, 5.0) was able to extract the analytes effectively and the expected analytical values were obtained. Results of difenoconazole, hexaconazole and triticonazole, LOD (limit of detection) and LOQ (limits of quantification) were in the range of 1.5–2.5 ng mL^{-1} and 5.3–8.0 ng mL^{-1}, respectively. In the developed successful method, relative standard deviations (RSDs) were obtained in percentages less than 6%. The optimized MOF-nanoflower-based d-SPME/ HPLC-DAD method was then applied for the detection of difenoconazole, hexaconazole, and triticonazole in environmental water, fruit juices, and food samples. The method applied to the analysis of triazole fungicides was successful with high recovery in the range of 92-101 %.

KEYWORDS: Triazole fungicides, dispersive- solid phase microextraction, environmental samples, high-performance liquid chromatography.

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[OP11]

CHEMICAL COMPOSITION OF FRUITS AND LEAVES OF SOME BLACK MULBERRY, CHOKEBERRY AND ELDERBERRY GENOTYPES

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The medicinal use of herbal natural resources is a traditional practice that has persisted over time and is now still attracting attention by consumers and researchers [1]. Recently, the importance of fruits in diet for human health has been emphasized. Fruits have medicinal properties associated with the presence of bioactive chemical components, which are compounds with potential antioxidant properties. The previously published reports showed these compounds can greatly affect the course of disease processes by counteracting oxidative stress [2-3]. Associating this important effect with the of fruits has increased the number of studies on this subject. The aim of the present study to characterize black mulberry, chokeberry and elderberry different genotypes with regards to tocopherols, amygdalin, phenolic compounds and elements contents in their berries and leaves. The main anthocyanins components were determined using liquid chromatography-tandem mass spectrometry (LC-MS/MS), as well as individual phenolic compounds, tocopherols and amygdalin were quantified by high-performance liquid chromatography with diode-array detection (HPLC-DAD) and element contents were determined by inductively coupled plasma optical-emission spectroscopy (ICP-OES). Principal component analysis was performed to reveal the differences between fruit species and genotypes. The obtained results showed the presence of a significant amount of primary and secondary compounds in the evaluated fruits and leaves, and significant differences among fruit species and genotypes. Analyzes showed the presence of chlorogenic acid (fruit: 46.91-309.94 mg/100 g DW, leaves:1457.49-3542.53 mg/100 g DW), rutin (fruit: 22.14-423.46 mg/100 g DW, leaves: 256.85-1626.36 mg/100 g DW) and cyanidin derivatives as the predominant phenolic compounds in all fruit species, besides in leaves samples, phenolic acids and flavonoids are prominent compounds. Calcium (fruit: 999.56-3769.41 mg/100 g DW, leaves: 1204.01-3802.27 mg/100 g DW) and potassium were the dominant elements in berries and leaves. The *in vitro* antioxidant activities of the plant extracts indicate that they could be used to prevent oxidative stress and associated disorders. In conclusion, Adoption of functional foods with high antioxidant potential, minerals, such as *Aronia melanocarpa*, *Morus nigra*, *Sambucus nigra*, will improve the effective and cost-effective management of free radical diseases while avoiding the toxicities and undesirable side effects caused by conventional drugs.

KEYWORDS: *Aronia melanocarpa*, *Morus nigra*, *Sambucus nigra,* Antioxidants, LC-MS/MS

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[OP12]

DEVELOPMENT OF A FABRIC PHASE EXTRACTION-BASED SENSITIVE ANALYSIS METHOD FOR THE DETERMINATION OF LEVETIRACETAM AND LAMOTRIGINE DRUG MOLECULES

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Epilepsy is a neurological disease that occurs in the form of seizures. Epilepsy, caused by abnormal electrical activity in brain cells, causes temporary disruption of a person's brain activity. The worldwide prevalence of epilepsy, which is characterized by short seizure periods, is 1%. Antiepileptic drugs (AEDs) are among the most commonly prescribed centrally acting agents. In the future, a series of pharmacogenetic tests may guide treatment to select the most appropriate AED and monitor the antiepileptogenic and evolutionary status of the disease [1]. Detecting the nanoscale of AEDs is critical for drug delivery, therapy, disease management, and drug side effects. The presence of endogenous parasites in biological matrices increases the difficulty of AED detection.

Levetiracetam (LEV) is a new antiepileptic drug that has been used in recent years and is effective as a monotherapy for epilepsy in partial onset seizures with or without secondary generalization, or as an adjunctive therapy for tonic-clonic seizures, partial and myoclonic seizures[2]. Lamotrigine (LTG),) against partial and secondary generalized tonics belonging to the phenyltriazine class, as well as clonic seizures and idiopathic (primary) generalized epilepsy[3]. Within the scope of this study, a sensitive analytical method based on HPLC-PDA after fabric phase extraction method (FPSE) has been developed for LEV and LTG, which are currently used as new generation antiepileptic drug active ingredients[4]. This analytical method was planned to be prepared as an effective solid phase support material with high affinity for drug molecules, low cost, with high accuracy, good selectivity and easy application for target molecules. All experimental variables of the method (such as sample volume, sorbent amount, adsorption and desorption time, pH, selectivity and linear range, ideal solvent selection for desorption) were optimized and the most ideal experimental conditions were determined for FPSE method. The linear working range of the developed method was figured out as 10.0-1000.0 ng mL^{-1} for both molecules (LEV and LTG), and the detection limits of the method were worked out as 2.72 and 3.64 ng mL^{-1}, respectively.

KEYWORDS: Levetiracetam (LEV), Lamotrigine (LTG), Fabric phase sorptive extraction, HPLC-DAD

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[OP13]

SIMULTANEOUS DETERMINATION OF PRAVASTATINE SODIUM AND GLIPIZIDE DRUG MOLECULES AFTER FABRIC PHASE MICROEXTRACTION

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In recent years, use of antidiabetic and antilipidemic drugs increased particularly for old and chronic patients. It is important to analyze the low concentrations of these molecules in terms of monitoring the therapeutic dose of these drugs and the follow-up of excretion products after use [1]. This study focus on sensitive and simultaneously analysis of Pravastatin sodium (PRV), which is used in the treatment of hyperlipidemia and hypercholesterolemia, and Glipizide (GLP) molecules, an oral antidiabetic sulfonylurea group. An analytical approach has been developed for simultaneously detection by means of a sample pretreatment procedure and chromatically analysis by HPLC-DAD system.

Fabric phase sorptive extraction(FPSE) method was developed and optimized as a pretreatment procedure of drug molecules prior to HPLC-DAD analysis. FPSE method was submitted to scientific world by Kabir and Furton [2], it reduces the extraction shortcomings generally encountered in the well-known traditional sorbent-based sample preparation procedures, like solid phase extraction (SPE) and an conventional solid phase microextraction (SPME). For FPSE methods experimental variables such as pH, adsorption and desorption conditions were studied and optimized step by step. After optimization tests; linearity, repeatability, accuracy, detection and quantification limits of developed FPSE-HPLC-DAD method were determined by means model solutions including both drug molecules. As a result of these experiments, the analytical signals were followed a linear increasing in the range of 20-1000 ng mL^{-1} while the detection limit is 6.28 ng mL^{-1} for both molecules. Accuracy of method was teset by means of recovery test in simulated urine samples and the relative standard deviations were lower than 4.20 % for 3 replicate measurements at 100 ng mL^{-1} concentration level.

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[OP14]

IMPACT OF SOLUBLE AND EXCHANGEABLE CONCENTRATIONS OF ELEMENTS IN SURFACE SEDIMENTS FROM RECREATIONAL AREAS ON CULTURABLE BACTERIAL BEHAVIORS

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Metal contamination in the marine environment such as sediments is a primary global concern due to their potential risks and hazards to living organisms [1,2]. Sediments have a significant role in environmental quality owing to their sing and source characteristics of the environmental contaminants [2]. Bacteria also play vital roles in driving multiple ecosystem processes in marine ecosystems, for instance nutrient cycling and waste decomposition [3]. However, the environmental vulnerabilities of sediment living systems like bacterial communities due to the various human activities remain unclear. Therefore, in this study, surface sediments were conducted within the coastal areas used for recreational in the Istanbul-Turkey. Soluble and exchangeable elemental concentrations in sediment samples from 12 recreational areas were determined to understand the effect on the culturable gram positive and gram-negative bacterial responses. Na, Mg, K, Ca, P, Fe, Cu, Mn, Zn, and Al determined in soluble and exchangeable fractions of sediments using ICP-OES. Viability and main biochemical markers (protein, antioxidant and lipid peroxidase) of gram-positive *Staphylococcus aureus* and gram-negative *Pseudomonas aeruginosa* was assessed with exposure to soluble and exchangeable fractions of sediments for 1-42 hours.

KEYWORDS: Sediment, pathogens, biochemical indicators, metals, beach.

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[OP15]

MECHANICAL AND MICROSTRUCTURAL PROPERTIES OF ALGINATE AND COMPOSITE FILMS

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Alginate, one of the most common biopolymers found in nature, is especially popular in the field of packaging due to its advantages such as economic accessibility and processability [1-3]. In this study, research on the production of alginate-based packaging materials with high economic potential will be presented. Brown algae collected from various regions were transformed into sodium alginate using the alkaline method and examined in detail by ^{1}H-NMR and FTIR. Rheological properties, such as viscosity η of sodium alginate solutions and film formation of calcium alginate, were studied using an oscillatory rheometer. Subsequently, the frequency-dependent elastic *G'*, viscous modulus *G"* and loss factor δ values of the films formed between the cone-and plate geometries (the cone is 40 mm in diameter, with an angle of 4°) were examined. The water absorption and drying profiles of the prepared films were examined in various salt solutions. The mechanical properties of the films during tear and rupture tests were examined with uniaxial tensile tests. In addition, within the scope of this study, the light transmittance properties of the films were examined and their suitability for use as packaging materials was discussed.

KEYWORDS: Brown algae, alginate, film, characterization, mechanical properties.

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[OP16]

ISOLATION AND CHARACTERIZATION OF BIOACTIVE SECONDARY METABOLITES OF THE ENDEMIC & EDIBLE *POLYGONUM SİVASİCUM* BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY TOGETHER WITH COMPREHENSIVE CHEMICAL ANALYSIS

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Polygonaceae family is represented by 48 genera and 1200 species in the world [1]. Our country is home to 10 genera [2], and *Polygonum* genus contains 40 species which makes it the largest member of this family in Turkey. *Polygonum sivasicum* Kit tan & Yıldız, which is one of the 7 endemic *Polygonum* species, grow naturally in Sivas at 1700 m altitude. The aim of this thesis is to isolate bioactive secondary metabolites from *P. sivasicum* and elucidate the chemical structures of isolates. Aerial parts of the plant were collected and dried under optimum conditions. Ground plant material was macerated with hexane, ethylacetate, chloroform, and methanol, respectively. Plant residue was infused with 80 ºC demineralized water. After filtration, the water infusion was frozen to remove water by using freeze dryer. After the extraction processes, 5 extracts were obtained. In addition to total phenolic and flavonoid content; antiradical potential of the extracts was carried out using DPPH free radical scavenging, and ABTS cation radical scavenging while antioxidant potential of the extracts was carried out using the CUPRAC antioxidant activity, metal chelating, and β-carotene-linoleic acid assays.

Structure identification and elucidation of isolated pure compounds were carried out by both 1D- and 2D-NMR and HRMS spectroscopic methods. For that fractions from the extracts were obtained with Silica gel, C18 and Sephadex LH-20 column packing materials. *β*-sitosterol and di(2-ethylhexyl)-phthalate were isolated from the hexane extract of *P. sivasicum*. The methanol extract afforded three compounds; annphenone, hyperoside, and daucosterol. The fatty acid profile of hexane extract was obtained using GC-MS. A phenolic profile study was conducted using LC-HR/MS. The first study on the isolation of the secondary metabolites of *P. sivasicum* that led to the identification of five compounds. Also, annphenone was isolated from a *Polygonum* genus, for the first time. Hyperoside, detected as one of the major phenolics by LC-HR/MS, was also isolated in this study.

KEYWORDS: *Polygonum sivasicum*, secondary metabolites, NMR, LC-HRMS, GC-MS.

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[OP17]

AN APPLICATION TO ELECTROCHEMICAL DETERMINATION OF COVID-19 DRUG: FAVIPIRAVIR AT PENCIL GRAPHITE ELECTRODE BOOSTED WITH FUNCTIONALIZED-CARBON NANOTUBES

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The coronavirus disease (COVID-19) first emerged in Wuhan, China, in humans with various symptoms such as arrhythmias, shock, multi-organ failure, and heart and kidney failure [1]. The World Health Organization (WHO) reported approximately 770 million cases, and nearly 7 million people have died up to now [2]. Although the pandemic necessitates an urgent solution for treatment, it was deemed appropriate to use drugs with approved safety in the first place, since it takes years to develop a new efficient drug and investigate its influence on COVID-19 [3]. One of these drugs is favipiravir (FVP), which was used in the early periods of this pandemic disease and shows its effect on COVID-19 by inhibiting its RNA polymerase enzyme, which is responsible for virus replication [1]. The FVP dosage plays an important role in the treatment of COVID-19, as improper dosage can result in toxic or sub-therapeutic concentrations without distinct clinical benefits. Electrochemical detection platforms have been extensively preferred in pharmaceutical analysis due to their unique properties such as miniaturization, portability, low cost, fast response, acceptable sensitivity, high selectivity, accuracy, precision, and ease of operation [4]. This work describes a novel, sensitive, and selective detection platform for the electrochemical determination of FVP at a functionalized multi-walled carbon nanotube (f-MWCNTs)-coated pencil graphite electrode (PGE). The electrochemical demeanor of FVP at both bare PGE and f-MWCNTs@PGE was examined by both cyclic (CV) and differential pulse (DPV) voltammetry methods. The results indicated that the use of f-MWCNTs provides remarkable analytical performance toward the electrochemical oxidation of FVP. The proposed sensor gives a wide linear response between 1.0 and 1500 μM and shows a fairly low detection limit (0.27 μM). The proposed method also shows high selectivity towards FVP in possible interferences that can be found in real samples. The feasibility studies applied to a pharmaceutical formulation, FAVIRA® tablet (FVP content: 200 mg), confirmed that the designed sensor enables the determination of FVP with acceptable accuracy and precision (found: 201.0 ± 3.0 mg, RSD = 1.4%). Moreover, the applicability of the proposed sensor was further examined by recovery studies performed in different matrices, such as artificial blood and urine samples, and the obtained recovery values between 91.4 – 110.3% also supported the high applicability of the electrochemical sensor designed for the determination of FVP. The proposed sensor was hoped to be an option for simple, low-cost, and accurate determination of FVP in the near future.

KEYWORDS: Carbon nanotubes, COVID-19, favipiravir, pencil graphite electrode, voltammetry.

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[OP18]

ELECTROCHEMICAL DETERMINATION OF *ENTACAPONE*, AN ANTIPARKINSON DRUG ACTIVE INGREDIENT, USING PENCIL GRAPHITE ELECTRODE

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Entacapone (ETC) is a potent and specific inhibitor of peripheral catechol-O-methyl transferase (COMT) used in the treatment of Parkinson's disease [1]. COMT inhibitors have adverse effects such as nausea, vomiting, orthostatic hypotension, urine discoloration, increased dyskinesia, and fatality [2]. Therefore, the determination of ETC in pharmaceutical formulations and biological fluids such as urine and human blood serum is important for human life. In this context, various analytical methods using chromatographic, spectroscopic, and electrochemical techniques have been developed for ETC determination in various samples. Among them, recent electroanalytical methods have found great attention in the determination of pharmaceutical compounds, because they offer several advantages, such as high selectivity, simplicity, low cost, and fast response [3].

The aim of this study is to perform selective and highly sensitive determinations of ETC based on an easily available, disposable, highly electrochemically reactive, and very advantageous pencil graphite electrode (PGE). Although various modified electrodes have been reported for the determination of ETC, PGE has not been used for the determination of ETC based on both oxidation and reduction. Thus, firstly, the electrochemical behavior of ETC was studied by recording cyclic voltammograms of ETC based on the pH of the supporting electrolyte and scan rates. Results show that both oxidation and reduction of ETC at PGE are performed by a diffusion-controlled process, because both peak currents increased linearly based on the square root of the scan rate. Analytical performance studies were performed by recording differential pulse voltammograms (DPVs) of ETC in 0.1 M H_2SO_4 under optimized conditions (pulse time, pulse amplitude, step potential, and scan rate are optimized as 1 ms, 200 mV, 10 mV, and 50 mV/s for the cathodic peak at -100 mV and one oxidation peak at +550 mV). The cathodic peak at around -100 mV (C1) and anodic peak at +550 mV have linear responses in the range from 1 to 1000 nm and 2.5 to 1000 nM, respectively, with a limit of detection (LOD) of 0.36 and 0.69 nM. RSD values found below 5% for ETC in the two different concentrations (50 and 500 nM) indicate the proposed electrode has acceptable intra-day and inter-day precisions. Finally, the proposed method was successfully applied to determine ETC in pharmaceutical tablets.

KEYWORDS: Entacapone, pencil graphite electrode, voltammetry, pharmaceutical analysis.

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[OP19]

REDEFINING PRECISION IN CANCER TREATMENT: A NOVEL ELECTROCHEMICAL APPROACH USING BIMETAL OXIDE COMPOSITES FOR NIRAPARIB QUANTIFICATION

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According to World Health Organization (WHO) data, after ischemic heart disease, cancer is currently the second most prevalent cause of death worldwide, and it is anticipated to exceed it by the year 2060, thereby becoming the primary cause of mortality [1]. In recent years, significant progress has been achieved in the exploration and creation of antineoplastic medications. Niraparib (NRP), a groundbreaking compound belonging to the PARP inhibitor category and received FDA approval in 2017, serves as a prime example of this innovative therapeutic approach [2]. PARP inhibitors like NRP are usually administered at a standardized dosage, without taking into account differences in patients' body mass index. NRP's limited therapeutic range highlights the importance of precise control over its concentration to strike the right balance between effectiveness and potential side effects. Thus, the development of a highly sensitive, swift, and precise technique for detecting NRP in biological samples is of utmost importance [3]. Hence, this research achieved effective and precise detection of NRP in pharmaceutical and biological samples by creating a glassy carbon electrode enhanced with bimetal oxide nanoparticles. The performance of the sensor designed with a bimetal oxide composite consisting of ruthenium (IV) oxide (RuO_2) and bismuth (III) oxide (Bi_2O_3) was assessed using the differential pulse voltammetry (DPV) method under optimum conditions. Consequently, the limit of detection (LOD) for NRP was determined as 3.72 µM and the limit of quantification (LOQ) as 12.4 µM. The analysis of NRP was systematically carried out in solutions containing a range of interfering substances. The sensor that was developed exhibited exceptional attributes, including a remarkable selectivity (RSD%=1.17%), as well as consistent repeatability (RSD%=3.83%) and reproducibility (RSD%=3.26%). The electrochemical sensor developed exhibited strong performance in accurately measuring NRP concentrations in both pharmaceutical products and urine samples. The results were substantiated by recoveries ranging from 99.63% to 102.64% for capsules and 99.95% to 103.52% for urine samples.

KEYWORDS: Niraparib, electrochemical sensor, bimetal oxide composite, differential pulse voltammetry.

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[OP20]

DEVELOPMENT AND FABRICATION OF A MOLECULARLY IMPRINTED POLYMER-BASED ELECTROANALYTICAL SENSOR FOR THE DETERMINATION OF ACYCLOVIR

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Acyclovir (ACV), a synthetic nucleoside derivative of purine, is one of the most potent antiviral medications that is recommended in the specific management of varicella zoster and herpes simplex virus [1, 2]. Molecular imprinting polymer (MIP) was utilized to create an effective and specific electrochemical sensor using a straightforward photopolymerization process to measure ACV. The polymeric thin coating was developed using template molecule ACV, a functional monomer acrylamide (AM), a basic monomer 2-hydroxyethyl methacrylate (HEMA), a cross-linker ethylene glycol dimethacrylate (EGDMA), and an initiator 2-hydroxy-2-methyl propiophenone upon the exterior of the glassy carbon electrode (GCE). Fourier-transform infrared spectroscopy (FT-IR), Scanning electron microscopy (SEM), electrochemical impedance spectroscopy (EIS), and cyclic voltammetry (CV) techniques were employed for the purpose of characterizing the constructed sensor (AM-ACV@MIP/GCE). Differential pulse voltammetry (DPV) of a ferrocyanide/ferricyanide redox reagent was used to detect the ACV attachment to the specific MIP spaces. The sensor exhibits a linear performance throughout the concentration region $1 \times 10^{-11} - 1 \times 10^{-10}$ M and the limit of detection (LOD) and limit of quantification (LOQ) were 0.73 pM and 2.42 pM, respectively. For the electrochemical study of ACV, the sensor demonstrated high accuracy, precision, robustness, and quick detection time. Furthermore, the developed electrochemical sensor exhibited exceptional recovery in tablet form and commercial human blood samples, with recoveries of 99.06±0.75% and 100.16±0.42%, respectively. The findings showed that the AM-ACV@MIP/GCE sensor would effectively be used for the direct assessment of pharmaceuticals from actual specimens and would particularly detect ACV in comparison to structurally similar pharmaceuticals.

KEYWORDS: Acyclovir, molecularly imprinted polymer, electrochemical determination, photopolymerization, drug analysis

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[OP21]

NOVEL HRMS APPROACHES FOR THE ANALYSIS OF PESTICIDE RESIDUES IN HIGH CONSUMPTION FRUIT COMMODITIES

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Fruits have been always at a prominent position concerning healthy dietary habits. To ensure sustainable production and food quality, pesticides have been utilized for controlling the spread of plant diseases. Unfortunately, the inappropriate or illegal use of pesticides often leads to the presence of various residues in fruits, posing severe risks to both the ecological environment and human health. In this study, a screening strategy combining target and suspect HRMS approaches for analysing pesticide residues in fruits is demonstrated. The validation of a targeted QuEChERS method was successfully carried out for a selected list of more than 30 pesticides. The pre-selected matrices included high consumption fruit commodities in Greece as table grapes, apples, pears, various citrus fruits and strawberries. The QuEChERS method proved to be highly efficient in extracting the selected pesticides, with recoveries exceeding 70%, excellent linearity ($R^2 > 0.99$), and remarkable precision (RSDs < 20%). The quantification limits for the majority of the analytes were below 10 μg/kg, satisfying the established maximum residue limits by the European Commission. Ultra-high performance liquid chromatography coupled with a hybrid LTQ/Orbitrap HRMS was applied for analysis. A suspect screening workflow was also developed based on an in-house database comprising of approximately 400 pesticides, commonly applicated and traced in relevant commodities. Exact masses and confirmation by MS^2 data were employed for this purpose. Method validation and pesticide identification were satisfactory, considering the SANTE EU Guideline criteria. Ultimately, this combined strategy is expected to act as an early warning system for ensuring food quality and the sustainability of agricultural production.

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[OP22]

EASY APPLICATIONS OF SOLID PHASE EXTRACTION FOR SENSITIVE ANALYSIS OF DRUG MOLECULES BY CONVENTIONAL HPLC SYSTEM

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Determination of drug molecules in biological samples is so important to follow their therapeutic and toxic effects on human body. Trace concentrations of target molecules and high levels of matrix components complicate this analysis. Hybrid and expensive instrumental systems are used to carry out sensitive analysis of drugs such as HPLC-MS, HPLC-MS, GC-MS, HPLC-MS-MS, etc. Nature of biological samples makes it mandatory to apply a sample pre-treatment procedure before analysis. Moreover, most of these samples cannot be directly submitted to analysis instrument. It needs to remove potential interferences from samples and the concentration of target molecule should be increased higher than limit of detection of instrumental system.

Solid phase extraction methods are most preferable approaches for sample preparation of biological samples. The used adsorbent in solid phase extraction (SPE) techniques provides the main novelty of the developed method. Selectivity, sensitivity, accuracy, reusability, reproducibility, and feasibility of new methods completely depends on developed material. So, scientists are trying to produce new and useful material as a potential adsorbent. Magnetic materials are most preferred adsorbents thanks to modified surfaces depending on chemical structure of target molecules. These materials form basis of magnetic solid phase extraction (MSPE) methods. Generally, synthesis of these particles take place in 3 step. Firstly, Fe_3O_4 is synthesized by means of Fe(II) and Fe(III) salts. Secondly, silane groups are added to protect surface of particle and to provide open functional groups such as tetraethylorthosilicate (TEOS), 3-Aminopropyl)triethoxysilane (APTES), (3-Mercaptopropyl) trimethoxysilane (MPTMS)[1]. And final step, surface modification is completed with a special group depending on chemical structure of target molecules. As example; dithizone was used for sensitive determination of Sibutramine (obesity drug)[2], hexadecyl trimethyl ammonium bromide for antidepressant drugs (viladozone and duloxetine)[3], diamino benzidine tetrachlorohydrate for anticancer drugs (gemcitabine and paclitaxel)[4], tetraethylenepentamine (TEPA) for anticancer drugs (anastrozol and letrozole)[5], and decanoic acid for pesticides (propoxur and fenitrothion).

KEYWORDS: Dispersive liquid-liquid microextraction, endocrine disruptors, experimental design, pesticides.

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[OP23]

DETERMINATION OF *N*-NITROSAMINES IN THE GAS CHROMATOGRAPHY COUPLED WITH TANDEM MASS SPECTROMETRY (GC-MS/MS) BY USING HYDROGEN AS CARRIER GAS AND THE INVESTIGATION OF THEIR MASS SPECTRUMS UNDER THE PLAUSIBLE OF HYDROGENATION

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The *N*-nitrosamines are of great concern, because of their well-known carcinogenetic and mutagenic properties [1]. Thus, *N*-nitrosamine analysis is performed in several aspects of matrixes, such as environmental, food, and pharmaceutical etc. [2]. The emergence of tandem mass spectrometry coupled with gas chromatography (GC-MS/MS) is enabling low detection limits in matrix samples. One of the novel approaches for gas chromatographical analysis is selecting hydrogen as a carrier gas in order to reduce analysis time within improved resolution. Therefore, in this study 15 *N*-nitrosamines were investigated in terms of the possible interaction with hydrogen yielding to hydrogenation, scrutinization of mass spectrum profiles, selectivity, sensitivity, and long-term injection causing dirtiness in mass spectrometer cleaning process. To reduce the total analysis time, it could be able to set at 50psi inlet pressure along with 3ml/min column flow, also high oven temperature rate might be applied without any restriction. The acquired results show that under the applied analytical conditions there is no hydrogenation was observed for targeted compounds, however some of the *N*-nitrosamine compounds lead to break down products. This phenomenon was scrutinized in large injection volume (LVI) temperature profile in inlet, ion source parameters, and electron voltage etc. Additionally, the isotopic mass profile of compounds both isotopic space and isotopic relative abundances was also evaluated. It was observed that the *N*-nitrosamines, which have low mass fragmentation profile, were under the high matrix effect. It is necessary to apply the clean-up procedure, otherwise it wouldn't be possible to reach lower detection limits. On the other hand, the long-time injection profile (~ 200) shows that satisfactory level of standard calibration solution check was acquired, this is thought that probably due to the cleaning ability of hydrogen carrier in ion source of mass spectrometry. It has been demonstrated that GC-MS/MS system with hydrogen carrier gas is a fast analysis (< 7.5 min total analysis time), higher resolution and alternative method for determining of *N*-nitrosamines. Finally, the proposed methodology exhibits satisfactory analytical figure of merits results in linearity (0.5 – 50 ng/mL), limit of detection (0.06 – 2.0 ng/mL), recovery (65±6 %– 120±8 %), and repeatability (3.0 – 16.7%). Furthermore, the matrix effect and quantification were performed in real samples.

KEYWORDS: *N*-nitrosamines, GC-MS/MS, hydrogenation, matrix effect.

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[OP24]

A SCIENTIFIC RESEARCH ON THE PRESENCE OF BISPHENOL A (BPA) AND DI-(2-ETHYLHEXYL) PHTHALATE (DEHP) RELEASED FROM DIFFERENT PLASTIC CONTAINERS INTO CITRUS OILS

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In food safety, knowing the chemicals contained in plastic storage containers that come into contact with food and the health risks arising from these chemicals is vital for food quality and safety. Various chemicals such as phthalate and bisphenol, which have toxic, carcinogenic and mutagenic effects on human health and the environment, are used as plasticizers in some plastic storage containers. Wearing, scratching, heating, and contacting the storage containers in which these plasticizers are used during production cause the transition of these plasticizers to the food. This situation is known from previous studies, especially that it has potential endocrine disrupting and toxic effects on the hormonal structures of humans [1, 2]. In this study, di-(2-ethylhexyl) phthalate (DEHP) and Bisphenol A migration depending on time from polyethylene terephthalate (PET), high-density polyethylene (HDPE) and low-density polyethylene (LDPE) storage containers, in which two different citrus (mandarin and orange) oils are stored, were investigated. Within the scope of the study, citrus oils kept in different plastic containers at +4 °C for four different time periods (3, 12, 16, and 17 months) were analyzed with Liquid Chromatography-Tandem Mass spectrometry (LC-MS/MS) by pretreating with acetone. The concentrations of DEHP in citrus oils stored in PET, LDPE and HDPE plastic containers were found to be between 0.0001 µg/kg and 0.4194 µg/kg. The presence of Bisphenol A was not found in any of the samples. In regulation (EU) No 10/2011 on plastic materials and products in contact with foodstuffs [3], since there is no direct limit value for the amount of phthalate in terms of migration limits in materials and products that come into contact with oil and fatty foods, an evaluation was made considering the DEHP limit value determined as 1.5 mg/kg in the materials and products that are used repeatedly in contact with non-oily foods [4]. When the obtained DEHP results were evaluated as a whole, it was observed that the types of storage containers had a significant effect on the phthalate concentrations and the phthalate release increased as the storage time increased. However, it is thought that citrus oils, which are intended to be stored for a long time, should be kept in non-plastic storage containers if possible, and if this is not possible, storing them in LDPE and HDPE plastic types instead of PET may be more appropriate in terms of phthalate release in line with this study.

KEYWORDS: Bisphenol A, citrus oils, di-(2-ethylhexyl) phthalate (DEHP), human health, plastic container

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[OP25]

SIMULTANEOUS DETERMINATION OF TENOFOVIR DISOPROXIL AND EMTRICITABINE BY HYDROPHILIC INTERACTION LIQUID CHROMATOGRAPHY IN TABLET DOSAGE FORMS

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Tenofovir disoproxil (TFD) and emtricitabine (ETB) are used together to treat adults against human immunodeficiency virus (HIV) and hepatitis B viruses [1]. Hydrophilic interaction chromatography (HILIC) is a technique with the advantages of reverse phase and normal phase chromatography [2]. A Simple, accurate and specific hydrophilic interaction liquid chromatography method was developed for the simultaneous estimation of tenofovir disoproxil fumarate and emtricitabin in tablet dosage form. The assay of the drugs were performed on a Ultisil HILIC Amid column (5µm, 3.0×150 mm i.d.) with DAD detection at 260 nm for TFD and 284 nm for ETB. The mobile phase consisting of 100 mM ammonium acetate solution and acetonitrile in the ratio of 15:85 (v/v), and a flow rate of 0.40 mL/min was maintained. The standard curve was linear over the range of 0.50-20 µg/mL and R^2 values are 0.9992 and 0.9987 for ETB and TFD respectively. The proposed method was validated in terms of Linearity, Range, Accuracy, Precision, Specificity. Within-day and between-day precision as expressed by relative standard deviation was found to be less than 2.0%. Proposed method was successfully applied for the estimation of TFD and ETB in combined tablet dosage form.

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KEYWORDS: Tenofovir disoproxil, emtricitabine, HILIC, DAD

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[OP26]

DEVELOPMENT OF NEUTRAL MONOLITHS FOR PROTEOMICS ANALYSIS IN NANO-LIQUID CHROMATOGRAPHY

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Proteomics analysis is a very essential issue in modern analytical chemistry. In recent years, considerable technological advances have been achieved toward enabiling the proteomics analysis using nano-liquid chromatography (nano-LC) systems [1,2]. Nano LC showed undoubtedly considerable leaps in the understanding of proteomics [3]. One of the major challenge in proteomics analysis is that the majority of proteins are found in low abundance. It is very essential to explore these proteins in order to understand their functional roles in all life science. In this sense, the development of new materials such as new nano-columns are crucial for proteomics analysis [4]. Monolithic nano-columns are promising materials for the analysis of low abundance proteins in complex proteome mixtures. In this presentation, the development of novel neutral monoliths is introduced, evaluating as the separation media for use in proteomics analysis by nano-LC. Firstly, Naphthalen-2-ylmethyl methacrylate (NMM) was prepared according to pertinent literature [5]. The neutral monolith was prepared by *in-situ* polymerization of 2-NMM and POSS-MA in a fused silica capillary column of 100 µm i.d. Various parameters such as porogenic solvents, including tetrahydrofuran (THF), dodecanol and toluene and temperature were investigated for morphology optimization. Final monolithic column (referred to as NMM column) was characterized by using scanning electron microscopy (SEM) and chromatographic analyses. SEM images of the columns showed that good incorporation between NMM and POSS-MA could be achieved. The chromatographic characterization of the neutral monolith was performed using homologous alkylbenzenes, including toluene, ethylbenzene, propylbenzene and butylbenzene and polyaromatic hydrocarbons (PAHs) were performed using the NMM column. The neutral monolith offered promising π-π interactions under reversed-phase conditions. The final column was compared with commercial counterpart and allowed better theoretical plates numbers up to 28400 plates/m in isocratic mode for ethylbenzene. Finally, the proteomics analysis of MCF-7 cell line was applied using the final neutral monolithic column in nano-LC UV system, allowing sensitive separation of peptides.

KEYWORDS: Monolith, Nano-LC, Polyhedral oligomeric silsesquioxane, Proteomics,

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[OP27]

QUANTIFICATION OF SOME METALLIC CONTENT OF ARONİA MELANOCARPA L. PLANT WITH ICP-OES

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Aronia melanocarpa L. plant, which is commonly known as black chokeberry, belongs to Rosaceae family and its berries have a deep purple color which indicates rich anthocyanins content. In recent studies, aronia has shown potential health benefits including antioxidant, anti-inflammatory, antidiabetic, antimutagenic, anti-carcinogenic and cardioprotective effects which result many products in the market. Analysis of metallic content of aronia is very important issue because some metals can be derived from aronia products which are constantly maintained over time in organisms. Therefore, metal detection and quantification is very important research area in pharmacognosy especially for food supplements, herbal teas etc. [1]. An efficient method should be developed for the analytical technique which will be selected. In this study, ICP-OES analytical technique will be used for the quantification of some important metallic content of *Aronia melanocarpa* L. plant produced in Türkiye. The appropriate harvesting time can be determined by using results obtained from this study. Additionally, the developed method can also be used as a quality control analysis for the market products such as food supplements, herbal teas etc. produced from this plant.

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[OP28]

DETERMINATION OF SOLUBLE AND GEOCHEMICALLY REACTIVE CONCENTRATIONS OF METALS IN SURFACE SEDIMENTS FROM LAKES IN MARMARA REGION-TURKEY, AND THEIR RISK ASSESSMENT

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Metal pollution of the marine environment has become a global problem since the absence or inadequate of clear environmental legislation and the increase of pollution from anthropogenic activities such as rapid urbanization, industrialization, and agricultural development [1,2]. Sediments include a large amount of organic substances that can sorb metals from the water systems, and they can also release metals back into the water systems when the environmental conditions varied. Therefore, sediments act as both a sink and source [3]. In this study, metal (Na, Mg, K, Ca, P, Fe, Cu, Mn, Zn, Al, Cd, Co, Cr, As, Pb, Hg, Sb, Ni) concentrations in surface sediment samples from 4 lakes from Marmara region-Turkey which are Iznik, Kucukcekmece, Tuzla and Buyukcekmece Lakes were investigated to ascertain the potential sources using ICP-OES, and environmental risks of metals. Na, Mg, K, Ca, P, Fe, Cu, Mn, Zn, and Al determined in soluble fractions of sediments; however, Na, Mg, K, Ca, P, Fe, Cu, Mn, Zn, Al, Cd, Co, Cr, and Ni were quantified in geochemically reactive fractions of sedimentd from 3 lakes. Risk assessment models were also conducted using pollution index, enrichment factor, and bacteria based experiments.

KEYWORDS: Metal, risk models, lake, human activities.

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[OP29]

DEVELOPMENT OF A TRIPLE ID-ICP-MS METHOD FOR SI TRACEABLE MEASUREMENT OF Pd IN WASTE PRINTED CIRCUIT BOARD MATERIAL

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Technology critical elements (TCEs) are a group of naturally occurring chemical elements increasingly used in high technology equipment including electrical and electronic devices, cellular phones, energy-efficient lighting, batteries, etc. The most common TCEs for which EC [1] released a list of strategic raw materials includes Co, Ga, Gd, Ge, Li, Nd, Pd, Pt and Rh. The recovery of these critical elements from waste electronic and electrical equipments (WEEEs) such as printed circuit board (PCB), light-emitting diodes (LEDs) and lithium ion batteries (LiBs) gained importance in recent years due to limited natural resources and high cost of production from primary sources compared to recycling from WEEE where TCEs are at higher concentrations [2]. In addition to economic benefit, recycling of these wastes decreases the uncontrolled emissions of TCEs to environment which may have negative effects on the living systems and serious environmental problems in long term accumulations. In recent years, as the recycling technologies of TCEs from WEEEs, their economic values of such waste materials increased significantly. The accurate determination of economic value of such waste materials requires reliable measurement methods and reference materials. Methods based on the isotope measurements are highly sensitive and reliable methods for the determination of elements at very low concentrations. In this study, as a part of a joint research project EMPIR 20IND01 MetroCycleEU received funding from EU under Horizon 2020, ID-MS method to obtain SI traceable results with a measurement uncertainty below 5% has been developed for characterization of PCB certified reference material. The PCB material, prepared by one of the project partners, BRGM, was processed and milled to pass through 200 µm was used for method development studies. For determination of Pd in PCB material, the material was dissolved in 2 ml of 65% (w/w) HNO_3 and 6 ml of 30% (w/w) HCl using microwave digestion system at 200°C for 30 min. For the preparation of samples for triple ID-ICP-MS measurements, the sample blends were prepared by spiking the isotopic CRM (enriched Pd-104) before digestion. The measurements were done by using sector field ICP-MS and Triple-Q ICP-MS instruments. The molecular interferences arising from combination of plasma gasses and matrix elements (Zn, Ni) were investigated and minimized by using either HR mode or reaction/collision gasses of the instruments. The measurement uncertainty for the determination of Pd in PCB material is estimated according to GUM bottom-up approach and all its components are quantified using a commercial software.

KEYWORDS: Technology Critical Elements, Waste Electrical and Electronic Equipments, Waste Printed Circuit Board, Isotope Dilution ICP-MS, Palladium, Recycling

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[OP30]

MONITORING OF RADIONUCLIDES AND HEAVY METALS FROM WETLANDS IN KIRKLARELİ

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The largest wetlands of Kırklareli city are İğneada floodplain forests. Dupnisa Cave, Mert Longos, Erikli Longos, and Mutlu Stream Bed are within these wetlands [1]. This study aims to investigate the accumulation of radionuclides and heavy metals in wetlands as floodplain forests. In the study, the concentrations of radionuclides (^{222}Rn, ^{210}Po, and ^{210}Pb) in water samples were analysed using alpha spectroscopy systems. The heavy metals (Ag, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Li, Mo, Ni, Pb, V, and Zn) in the samples were analysed using the ICP-MS technique. Investigation of radionuclides (^{210}Pb, ^{210}Po, and ^{222}Rn) in wetlands is as important as studying heavy metals (Ag, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Li, Mo, Ni, Pb, V, and Zn) to understand the risk of acute with aquatic systems and fauna/flora. We assessed both radionuclides and heavy metals considering environmental pollution risk factors input anthropogenic and industrial.

KEYWORDS: ^{222}Rn, ^{210}Po,^{210}Pb, trace element, surface water

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[OP31]

DESIGNING Mo_2C/C MODIFIED BiOI HETEROJUNCTION NANOCOMPOSITES FOR ENHANCED PHOTOCATALYTIC EFFICIENCY

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With the increasing industrialization and population growth, the energy crisis and environmental pollution problems are becoming more and more serious [1,2]. Usable fresh water is subject to pollution, and with its mobility, toxicity, and persistence features in aquatic environments, organic pollutants will pose a significant threat to ecosystems and cause critical health dangers to humans and other living things. Photocatalytic oxidation technology is a green, efficient, and highly low-energy and non-secondary pollution-free method to convert light energy into chemical energy that can be used in wastewater treatment [1,2]. It is a green and environmentally friendly resolution to energy shortage and pollutant treatment [1,2]. Bismuth oxyhalides (BiOX: X = Cl, Br, I) are widely used as photocatalysts due to their molecular structure, superior optical, mechanical and protective properties [3]. Among the BiOX family members, BiOI had a fairly narrow band gap (~1.8 eV) and good visible light response performance. However, the photocatalytic activity of BiOI is restricted by the rapid recombination of photocarriers [3]. It is known that the recombination rate of BiOI modified with two or more semiconductors is reduced. Mo_2C, with the characteristics of low cost, Pt-like electronic structure, and superior photoelectric activity, has been widely utilized in energy storage, thermoelectricity, and photocatalysis [4-5]. In this work, BiOI, Mo_2C/C, and $Mo_2C/C/BiOI$ photocatalysts were synthesized. Structural, morphological, and optical characterizations of the prepared nanocomposites were carried out, and their photocatalytic activities were investigated in the degradation of indigo carmine dye. It was determined that $Mo_2C/C/BiOI$ nanocomposites showed increased photocatalytic activity when compared to pure BiOI and Mo_2C/C.

KEYWORDS: Photocatalytic activity, BiOI, Mo_2C/C, wastewater treatment

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[OP32]

GRAPHITIC CARBON NITRIDE AND MAGNETIC NANO DIAMOND (g-C_3N_4@NDs@Fe_3O_4): A MULTIFUNCTIONAL NANOMATERIAL FOR MAGNETIC SOLID PHASE EXTRACTION AND PHOTOCATALYTIC DEGRADATION OF SILDENAFILE CITRATE

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The determination of sildenafil citrate, which is one of the active species with sexual derivatizations at the top of the list in unconscious drug use, from lake water, seawater and commercial forms, and its appropriate and sensitive measurements after photocatalytic degradation were analyzed in ultra-high performance liquid chromatography-diode array dedector (UPLC-DAD). Graphitic Carbon Nitride And Magnetic Nano Diamond (g-C3N4@NDs@Fe3O4) was synthesized to extract sildenafil citrate efficiently, then characterized by FT-IR, XRD, FE-SEM, SEM-EDX methods and used as the extraction phase of SPME. A number of basic extraction parameters such as pH of the sample matrix, amount of adsorbent, eluent type and volume, sample volume, before and after method calibration curve were optimized [1-3]. Among the optimized parameters, the highest adsorption efficiency was observed at pH= 8.0 and eluted at 1.0 mL using ethanol-methanol (50:50) mixture for eluent type and volume. The adsorbent amount was studied between 10-100 mg and the maximum adsorption efficiency of sildenafil citrate at known concentration was determined as 45 mg. UPLC analysis of sildenafil citrate was performed at wavelengths of 286 and 292 nm. According to results of sildenafil sitrate, LOD (limit of Detection) and LOQ (limits of quantification) were 0,57 ng mL^{-1} and 1,75 ng mL^{-1}, respectively. In the developed successful method, relative standard deviations (RSDs) were obtained in percentages less than 2,7%. The method applied to the analysis of sildenafil sitrate was successful with high recovery in the range of 94-105 %.

KEYWORDS: sildenafil citrate, solid phase extraction, environmental samples, ultra high-performance liquid chromatography.

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[OP34]

DEVELOPMENT OF AN ADVANCED ELECTROCHEMICAL SENSOR FOR DETECTION OF ANTIOXIDANTS BASED ON POROUS METAL ORGANIC FRAMEWORKS

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Metal-organic frameworks (MOFs) are a type of porous, crystalline polymeric material composed of clusters or metal ions bonding with organic linking ligands. Due to their outstanding qualities, including their large surface area, high porosity, and versatile structure, MOFs have attracted significant interest across a wide range of areas [1]. Also, Extreme porosity in MOFs is the main driving force behind the classification of these structures as unique porous solid materials with properties distinct from more common and traditional porous materials [2]. Over the past 20 years, MOFs have become an attractive type of significant porous solid have drawn significant interest in storage, separation, gas adsorption, catalysis and sensors because of their permanent porosity, tunable pore sizes and rich surface chemistry [3]. Electrochemical sensor systems make excellent platforms for mass or energy conversion as they are quick, accurate, sensitive, and convenient. Since they only require a very small quantity of the sample for the electrochemical analysis, these sensor systems are efficient and perfect for the detection and monitoring of biological samples. It has been noticed that there are several sorts of materials such as MOFs that may be used to create electrochemical sensors, and their use is crucial for boosting the analytical performance of the sensor that will be created [4]. In our study, the surface of Glassy Carbon Electrode (GCE) was modified by using MOFs with metal nanoparticles, and the surface morphological properties of the modified electrodes were determined, as well as their electrochemical behavior by using different biological analytes such as butylated hydroxyanisole, tert-butylhydroquinone and propyl gallate, using various voltameter methods.

KEYWORDS: Metal organic framework, electrochemistry, analytical chemistry, sensor.

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[OP35]

ELECTROCHEMICAL DNA BIOSENSOR BASED ON SCREEN PRINTED CARBON ELECTRODE MODIFIED WITH P(L-METHIONINE)/Au-Pt NANOPARTICLES/DNA FOR THE DETECTION OF ERLOTINIB

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Metal nanoparticles provide an opportunity in the sensing layer modification of electrochemical biosensors to increase the conductivity and catalytic activity of the electrode [1]. Bimetallic nanoparticles have shown many notable properties compared with their monometallic counterparts [2]. Biopolymers as amino acids are interested in metal nanoparticle support and a good immobilization matrix for entering biorecognition (for example, DNA, protein, and enzyme) [3, 4].

This study presented a new biosensor employing immobilized Calf Thymus DNA (dsDNA) on a nano-structured biopolymer/Au-Pt nanoparticle onto a screen-printed carbon electrode. Nanoparticles (Au-Pt) and poly(L-methionine) (P-L) were simultaneously coated onto the screen-printed electrode surface (SPE) using electrodeposition and electropolymerization. The Au-Pt/P-L/dsDNA/ SPE sensor was investigated by Field-Emission Scanning Electron Microscopy, Energy-Dispersive X-ray Spectroscopy and Atomic Force Microscopy, Cyclic Voltammetry, and Electrochemical Impedance Spectroscopy. Various parameters were optimized, including pH, DNA concentration, L-methionine concentration, and nanoparticle concentrations.

The DNA biosensor prepared used the electrochemical analysis of a tyrosine kinase inhibitor Erlotinib (ER), for treating lung and pancreatic cancer. For this purpose, guanine (+0.8 V) and adenine (+1.1 V) oxidation peak currents were evaluated to determine ER. The oxidation peaks of adenine and guanine are linearly related to erlotinib concentration in the range between 0.032 nM and 1.0 nM, with a detection limit of 0.009 nM and 0.23-1.0 nM with a detection limit of 0.07 nM, respectively. The Au-Pt/(P-L)/dsDNA/SPE sensor has excellent reproducibility and anti-interference ability. Furthermore, the sensor was tested with pharmaceutical dosage forms and human serum samples.

KEYWORDS: Bimetallic nanoparticles, Biopolymer, DNA biosensor, Erlotinib, Screen-printed carbon electrode

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[OP36]

BIOSENSOR MICROCHIPS: THE STUDY OF THE RESPONSE OF THE PENCIL GRAPHITE ELECTRODE AGAINST CARCINOEMBRYONIC ANTIGEN (CEA) TO BE USED IN MICROCHIP APPLICATIONS

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Biosensors are devices used to detect biomolecules or their derivatives. The most important performance factors used to evaluate biosensors are sensitivity, specificity, and limit of detection. Miniaturization of biosensors is also a critical point in the literature. With increasing advances in this field, microchips have been used in advanced biosensor technology for full-scale diagnostics and point-of-care diagnostics, with features such as low-cost and high-speed diagnostic [1]. Microchips are a powerful tool for performing quantitative analysis of a wide variety of objects as they have many advantages such as high sensitivity, short analysis time, less sample consumption, high throughput, and low cost. Navarro-Nateras and colleagues used pencil graphite electrodes (PGE) to monitor glucose under cell culture conditions in a microfluidic device [2]. Prasertying et al. applied the pencil tip electrode modified with manganese oxides (MnOxides/PE) as a glucose sensor for amperometric detection in Flow Injection Analysis (FIA) systems [3]. In our study, the response of the anti-CEA modified pencil graphite electrode (Anti-CEA@PGE), intended to be used in microchips, against CEA in a standard electrochemical cell (Ag/AgCl reference electrode and platinum counter electrode) was examined. The analytical performance of the biosensor was examined by optimizing the concentration of anti-CEA and CEA incubation time, and the LOD and working range were determined within the scope of this study. Also, the selectivity and repeatability studies were performed.

KEYWORDS: Microchips, biosensors, CEA detection, pencil graphite electrode.

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[OP38]

MULTI-SPECTROSCOPIC AND VOLTAMMETRIC STUDIES ON THE INTERACTIONAL OF ANTICANCER DRUG CLADRIBINE WITH DOUBLE HELIX DEOXYRIBONUCLEIC ACID

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Cladribine is a purine analog, antineoplastic agent used to treat hairy cell leukemia and B-cell chronic lymphocytic leukemia [1,2]. After Cladribine is taken into the cell, it is metabolized to nucleotidecladribine triphosphate by the enzyme deoxycytidine kinase. Activated Cladribine participates in the DNA synthesis pathway where it impairs DNA synthesis and repair, causing DNA strand breaks [3,4,5]. DNA is the cellular target for many cytotoxic anticancer agents. Determining how drugs interact with DNA has become an important research area at molecular biology, medicine and chemistry. The interaction of drug molecules with DNA is an important area in pharmacology and has a vital role in the designing of more efficient and targeted drugs with lesser side effects. Several methods are used to determine these interactions [6]. In this study, the molecular interactions between Cladribine and fish sperm double strain DNA have been investigated using UV–Vis, fluorescence spectrometry, viscosity and voltammetric methods. The DNA binding constant of Cladribine was calculated for each method and the binding mode was determined.

KEY WORDS: Cladribine, DNA binding, spectroscopy, voltammetry

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[OP39]

GREEN CHEMISTRY AND SOME APPLICATIONS IN THE FOOD AND PHARMA INDUSTRIES

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Our planet is under severe stress. The population is now around 8 billion and, as it continues to rise, we need to consider our future generations. Resource efficiency, process efficiency, water quality, green solvents and element sustainability are areas we need to look at carefully in many industries. Green chemistry is a technique in chemical science that aims to use raw materials that are renewable, thereby reducing waste, and to avoid the use of toxic and potentially dangerous reagents and solvents in the production and utilisation of chemical products. Although green chemistry has been around for a few decades, green extraction is a relatively new concept in the food and pharma industries. Green extraction processes use renewable bio-based materials including alternative solvents whilst reducing energy consumption, making the processes safer and creating products which are less toxic. The majority of companies within the food and pharma industries utilise traditional methods of extraction such as solvent extraction, percolation or vacuum, steam, and hydro-distillation. Recent shifts in extraction techniques have increasingly concentrated upon reducing the use of solvents which are petroleum-based. More efficient green extraction methods, such as subcritical water extraction (SWE) [1], supercritical fluid extraction (SFE) [2], and microwave assisted extraction (MAE) [3] are being investigated and employed in the extraction of volatiles, non-volatiles, polyphenols, and essential oils from various plants. SWE as a technique, is considered rapid, economical, non-flammable, non-toxic, safe, environmentally friendly, easily available, and uses a green solvent. SFE (normally CO_2) is relatively quick due to the high diffusivity, low viscosity, and adaptable solvent properties of the supercritical fluid. MAE is a fairly new extraction method combining microwave and conventional solvent extraction techniques to increase extraction kinetics. These extraction techniques are not only more rapid and economical, but due to being considered friendly to the environment, they also allow these products to claim a green label, which is desirable to many customers.

KEYWORDS: Green chemistry, Green extraction, Food and pharma industries, Green label.

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[OP40]

DEEP EUTECTIC SOLVENT DISPERSIVE LIQUID LIQUID MICROEXTRACTION METHODS FOR THE ANALYSIS OF CHLOROPHYLL

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Microextraction and analysis of chlorophyll have been carried out via deep eutectic solvent-based by ultrasonic assisted dispersive liquid-liquid phase microextraction (DES-UA-DLLME) from plants and food products [1,2]. The DES-UA-DLLME method was developed by utilizing deep eutectic solvent (DES) which was prepared by heating process with a 1:1 ratio of choline chloride and urea (ChCl: U) [3]. pH, DES volume, sample volume, centrifugation and mixing time, DES type, matrix effect, etc. analytical parameters have been studied to increase the extraction efficiency of chlorophyll. The limit of detection (LOD), limit of quantification (LOQ), intra-day and inter-day relative standard deviation (RSD) were obtained as 0.007 µg/mL, 0.023 µg/mL, 1.3 %, and 1.9 %, respectively. The devised DES-UA-DLLME method has been implemented food, water, and plant samples. Also, the analyzed food products and plants were prepared by using ultrasonic and microwave heated extraction. Finally, addition/recovery studies have been carried out to water sample in order to prove accuracy of the method.

KEYWORDS: Dispersive liquid-liquid microextraction, endocrine disruptors, experimental design, pesticides.

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[OP41]

3D-PRINTED SORBENTS FOR SOLID-PHASE AND THIN FILM MICROEXTRACTIONS; APPLICATIONS IN ENVIRONMENTAL, BIOMEDICAL AND FOOD ANALYSIS

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In recent years, 3D printing has received unprecedented attention in many fields of science and technology [1]. Due to its capability of rapid prototyping, reduced manufacturing time, one-step manufacturing, and development of various materials for 3D printing, its applications in the field of analytical chemistry have grown increasingly [2]. In this research, application of 3D printing technology for the development of solid-phase microextraction (SPME) and thin film microextraction (TFME) were studied and developed in four main sections. First, preparation of mixed matrix membrane thin film based on graphitic carbon nitride and acrylate photo-resins was carried out using a digital light processing (DLP) 3D printer. After characterization, the prepared 3D printed membrane was used as TFME adsorbent in determination of estrone and 17-β-estradiol in environmental water samples. The LODs for both analytes were 1.5 μgL^{-1} and the LDR was 5-150 μgL^{-1}. In the second study, 3D printed solid phase microextraction scaffolds fabricated by a fused deposition modeling (FDM) printer was presented as a new tool for sample preparation. Designed cubic scaffolds based on biodegradable polylactic acid (PLA) with surface modification via alkaline treatment were used to extract three antifungal drugs, ketoconazole, clotrimazole and miconazole. The LDR of the method was 10-100 μgL^{-1} for plasma samples and 10-150 μgL^{-1} for wastewater samples, respectively. The LODs were 3.10 μgL^{-1} in both samples. In the third study, a new thin film was made using PLA filament by FDM 3D printer and its surface was modified by atmospheric cold plasma (CAP) as a fast, clean and dry surface modification method with minimum consumption of chemicals and energy. The proposed film was used as a new adsorbent for TFME of anticancer drugs including dasatinib and erlotinib from human plasma. The LODs and LDR of the method for dasatinib were 0.03 and 0.1-20 μgL^{-1}, and for erlotinib were 0.3 and 1-500 μgL^{-1}, respectively. In the fourth study, a hydrothermal method was performed to fabricate Co-Al LDH adsorbent on 3D printed aluminum-PLA composite to use as a SPME fiber. The proposed fiber was used for the extraction of six phenolic acids from the fruit juice samples including apple, red grape and pineapple. The phenolic acids under study (including vanillic acid, p-hydroxybenzoic acid, caffeic acid, ferulic acid, p-coumaric acid) had LDR of 0.1-100 μgL^{-1} and LOD of 0.03 μgL^{-1}. Protocatechuic acid had a LDR of 0.5 - 100 μgL^{-1} and LOD was 0.15 μgL^{-1}.

KEYWORDS: 3D printing, Solid phase microextraction, Thin film microextraction, Surface modification.

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[OP42]

INVESTIGATION OF THE EFFECTIVENESS OF DUMMY MOLECULARLY IMPRINTED POLYMER FOR THE RAPID AND SELECTIVE EXTRACTION OF MONOESTER PHTHALATES FROM URINE

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Phthalates are a group of synthetic chemicals commonly used as plasticizers in various consumer products, including plastics, cosmetics, and medical devices, to enhance flexibility and durability [1]. These compounds can migrate into the environment and human body [2]. Upon exposure, phthalates undergo metabolic processes in the body, leading to the formation of phthalate metabolites. Monitoring these metabolites provides insight into human exposure to phthalates and aids in assessing potential health risks associated with these widely used chemicals [3]. In this study, an innovative approach was devised to detect monoethyl phthalate (MEP), mono-n-butyl phthalate (MnBP), and mono-(2-ethylhexyl) phthalate (MEHP) monoesters in urine samples through gas chromatography-mass spectrometry (GC-MS). The technique centered around the utilization of molecularly imprinted polymer-based solid phase extraction (SPE), bolstered by methacryloyl-amido-L-tryptophan methyl ester (MATrp) as the functional monomer, ethylene glycol dimethacrylate (EGDMA) as the crosslinker, 2,2'-azobis(isobutyronitrile) (AIBN) as the initiator, and diethyl phthalate (DEP) as the dummy template molecule. Employing suspension polymerization, poly[(EGDMA-MATrp)] microspheres with a DEP imprint were synthesized and their characteristics were elucidated through infrared spectroscopy (FTIR), scanning electron microscopy (SEM), Brunauer-Emmett-Teller (BET) analysis, and X-ray photoelectron spectroscopy (XPS). The next step encompassed the creation of SPE cartridges, utilizing the synthesized microspheres as extraction material. The new optimized SPE method proved to be highly efficient in extracting the selected analytes, with excellent linearity ($R^2 > 0.98$), low detection limits (LOD) (≤ 1.20 µg/L), and remarkable precision (RSDs $\leq 9.34\%$). Under optimal SPE conditions, a comparative evaluation was conducted between the newly designed SPE cartridge and the commercially available OASIS HLB cartridge. Subsequently, the practical viability of the method was assessed through its application to real human urine samples. Consequently, a novel SPE procedure was successfully developed for the determination of phthalate monoesters.

KEYWORDS: Phthalate monoester, molecular imprinting, solid phase extraction, gas chromatography.

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[OP43]

EXTRACTION OF PREDNISONE IN NATURAL AND ARTIFICIAL BIOLOGICAL LIQUIDS WITH MAGNETIC NANODIAMOND/MOF-199 NANOCOMPOSITE PRIOR TO DETERMINATION BY HPLC

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Prednisone is a synthetic corticosteroid used to treat various inflammatory and autoimmune conditions. Prednisone at high doses and extended periods can lead to side effects and potential toxicity. Accurate and reliable measurements of prednisone in biological samples are essential for ensuring safe and effective treatment and optimizing drug dosing [1,2]. In this study, a novel, simple, and rapid technique employing a magnetic nanodiamond composite integrated with Metal-Organic Frameworks (mag-ND-COOH/MOF-199) was successfully developed for the separation and enrichment of prednisone in natural water, urine, artificial urine, and artificial sweat samples, followed by High-Performance Liquid Chromatography with Diode Array Detection (HPLC-DAD) for measurements. The synthesized sorbent was thoroughly characterized using Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Thermogravimetric Analysis (TGA), Brunauer-Emmett-Teller (BET) analysis, and X-ray Photoelectron Spectroscopy (XPS). The method demonstrates excellent extraction efficiency, with a limit of detection (LOD) and limit of quantification (LOQ) of 2.8 and 9.3 ng L^{-1}, respectively. Several critical analytical parameters such as pH, sorbent quantity, sample and eluent volumes, and adsorption-desorption time were optimized. Magnetic ND-COOH@MOF-199 facilitated the easy separation of the liquid phase through the application of an external magnet. This separation-preconcentration and determination method for prednisone in both model solutions and real samples proved to be rapid, simple, cost-effective, and reliable.

KEYWORDS: Solid phase extraction, prednisone, HPLC-DAD, biological samples.

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[OP44]

SYNTHESIS AND APPLICATION OF Fe_3O_4-MIL-53(Fe)@MXN HYBRID NANOMATERIAL FOR µ-SOLID PHASE EXTRACTION OF TRACE CADMIUM FROM OFFAL AND WATER SAMPLES

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Due to high solubility of cadmium in the aquatic ecosystem, plants and marine life can absorb cadmium into their biological systems. Following cadmium accumulates in soil and water, it is first absorbed by aquatic microorganisms and then through food to animals and people. Acute toxicity occurs by eating foods containing high levels of cadmium. Therefore, it is crucial to develop quick, accurate, and simple analytical techniques for detecting trace cadmium in environmental samples. Solid phase extraction (SPE) is frequently used as a preconcentration method because it is simple, has a high recovery rate, is easily accessible, and is simple to automate [1]. MXN, also known as titanium aluminum carbide (Ti_3AlC_2), is a non-oxide chemical with a hexagonal layered structure. MXN has received a lot of attention due to its unique properties such as high thermal stability and electrical conductivity, relatively good ecological stability, damage tolerance, nontoxic effect, affordable prices and simplicity of preparation [2]. Metal-organic framework (MOF) particles are a new family of crystalline porous materials that have gained a lot of interest because of their unique properties such as large surface area, tremendous porosity, various topologies, and high chemical and thermal stability. Amongst known MOFs, the MIL (Materials Institute Lavoisier) family, which is produced utilizing trivalent metal centers and carboxylic acid bridging ligands, has sparked the interest of researchers because to its high stability and porosity [3].

In this study, a SPE method using Fe_3O_4-MIL-53 (Fe)@MXN hybrid material as an adsorbent for rapid and sensitive preconcentration/determination of cadmium at trace levels in water and offal samples before determination the high-resolution continuum source flame atomic absorption spectrometry was developed. pH, adsorbent quantity, adsorption and desorption interaction times, eluent volume, model solution volume, and matrix effects were optimized. The method was validated with a certified bovine liver reference material. While quantitative recovery was achieved at pH 5.0, limit of detection and limit of quantification were found as 3.6 $\mu g\ L^{-1}$ ve 12.2 $\mu g\ L^{-1}$.

KEYWORDS: µ-solid phase extraction, cadmium, water samples, offal samples, preconcentration.

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[OP45]

PRODUCTION OF COMPLETE BLOOD COUNT REAGENTS FOR HEMOGRAM DEVICES AND MONITORING OF ANALYTICAL PERFORMANCE PARAMETERS

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Hematology analysis is usually the first line of diagnosis. Most procedures are occur in 3 steps; firstly, the blood is diluted, secondly white cells are lysed and red cells are detected, thirdly red cells are lysed than the white cells and subpopulations of white cells which are neutrophils, lymphocytes, monocytes, eosinophils, and basophils are detected. Hematology devices that depend on electrical impedance use lysing reagents to lyse cells. The devices require 2 to 6 reagents, depending on the characteristics of the devices. If the device is capable of analyzing 18 parameters (3-diff device) then 2-3 reagents are needed, for analyzing of 27 parameters (5-diff device) than 5-6 reagents are needed. The research is about the production of the hematology reagents for 5-diff hematology devices. According to the quality control test results performed with control blood, the developed kits work with 95% accuracy and relative standard deviations lower than %10 for RBC, WBC, PLT, HGB, Neu (%), Lym (%), Mon (%), Eos (%), Baso (%) parameters, respectively. The quality tests prove that the reagents showed reliable and stable results for hematology analysis.

KEYWORDS: Hemotology, Hematology Reagents, Blood Analysis, In-Vitro Diagnostic.

[OP46]

IN-VITRO RELEASE STUDY OF PT(II) AND FE(III) METALLOCEFOTAXIME DRUG CANDIDATES IN PH DEPENDENT RELEASING MEDIUMS MIMICKING HUMAN BIOLOGICAL FLUIDS

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Cefotaxime(CFT), a third- generation broad- diapason cephalosporin antibiotic against gram-positive and gram-negative bacterial infections, inhibits bacteria's cell wall conflation by binding to the targets of cephalosporin. Pharmacological parcels and natural exertion of cephalosporins are relatively advanced when they're in the form of essence complexes. Inspired by the superior pharmacokinetics and natural conditioning of metallocefotaxime medicine campaigners, the present study is the first attempt to probe the in- vitro releasing biographies of Pt- CFT and Fe- CFT medicine complexes. To that end, a crosslinked free-radical polymerized poly(acrylic acid)(PAA) grounded hydrogel system was prepared, also release of CFT, Pt- CFT, and Fe- CFT were examined at 37 ◦ C in pH dependent releasing mediums mimicking enzyme-free mortal stomach(pH1.2), intestine(pH7.4), and physiological body fluid(pH7.4). Degree of swelling and release biographies of essence- CFT complexes from the PAA hydrogel was compared to CFT. In- vitro antimicrobial exertion of CFT, Pt- CFT, and Fe- CFT was tested by agar slice- prolixity system. It has been observed that all hydrogel systems except for that of high weight probabilities of- methylenebisacrylamideAcrylic Acid loaded with low volume of Fe- CFT responded to all studied releasing medium. Scanning Electron Microscopy images of medicine loaded hydrogels have shown that the distribution of the lading material in the hydrogel matrix is relatively invariant. All the studied hydrogel systems show the loftiest SR in SPF(pH7.4) medium. As a result, PAA- grounded hydrogel matrixes prepared in this work have the eventuality to act as a suitable medicine carrier for the delivery of CFT, Pt- CFT, and Fe- CFT medicine campaigners.

KEYWORDS: Cefotaxime, Metallocefotaxime, Poly(acrylic acid) hydrogel, Drug release, Drug delivery.

[OP47]

PURIFICATION OF PHENYLALANINE AMMONIUM LYASE ENZYME FROM CLOVER LEAF AND DETERMINATION OF ITS KINETIC PROPERTIES

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The phenylalanine ammonia-liase (EC 4.3.1.24; PAL) is an enzyme that catalyze the non-oxidative deamination of L-phenylalanin and synthesized trans-synamic acid as a product [1]. The reaction catalysed by this enzyme prevents the accumulation of phenylalanine in the blood which is called fenylketonuria as a metabolic disorder. It can lead to mental impairment and neurological disorders in newborn babies, which makes PAL important in clinical applications [2]. In addition, the reaction catalysed by the PAL enzyme plays a pioneering role in the defence mechanisms of plants and contributes to the formation of the cell wall by the synthesis of lignin [3]. The PAL enzyme in the structure of the clover leaf is responsible for the synthesis reactions of antioxidants, the synamic acid derivative that is the most common in plant structure, and also has an impact on plant defence, which is vital for us. In this study, partial purification of PAL enzyme from clover leaf, determination of the kinetic properties of PAL, electrophoresis study, optimum UV-wave length determination (200-800nm) by using trans-synamic acid solution, creation of standard linearity with trans-synamic acid, and characterization studies for PAL were studied, respectively. In the wavelength at which the maximum absorbance was obtained, the absorbance measurements of all standard solutions were performed. As a result of the analysis, the highest absorbance value was observed at 283 nm. Therefore, all measurements were taken at 283 nm. After purification step, in order to find the molecular weight of the PAL enzyme partially purified from clover leaf and to check the purity of the enzyme, sodium dodecyl sulfate gel electrophoresis (SDS-PAGE) was performed. PAL enzyme solutions and reference markers consisting of different protein compounds were loaded for the electrophoresis process, and the purity control and molecular weight of the PAL enzyme were determined. In the next step, Tris HCl buffer solution was prepared at different concentrations, pH and temperatures as the optimal conditions, respectively. 7 different concentration points between 5.0×10^{-3} and 3.0×10^{-1} M, 9 different pH points between pH 5.0(±0.05) and pH 9.0(±0.05), 9 different temperature points between 10.0°C and 70.0 °C were studied, respectively. As a result of characterization studies at 283 nm, the optimum concentration, pH and temperature values were determined as 1.0×10^{-1} M, pH 7.0(±0.05) and 25.0ºC, respectively.

KEYWORDS: Clover leaf, phenylalanine ammonia-liase, enzyme purification.

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[OP48]

PURIFICATION OF POLYPHENOL OXIDASE ENZYME FROM AVOCADO BY AFFINITY CHROMATOGRAPHY

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Avocado fruit, which is in the category of most nutritious fruits, was firstly discovered in Central America and used as part of the diet of indigenous people for more than 5000 years. Avocado, a tropical fruit, is rich in fiber, protein, vitamins, antioxidants, and minerals [1]. Browning reactions are observed due to the high amount of polyphenol oxidase (PPO) in avocado [2]. In avocados, PPO enzymes catalyze the oxidation of phenols, which then polymerize into brown pigments. In this study, partial purification of PPO enzyme from avocado fruit, total PPO activity, examination of kinetic parameters and purification of PPO enzyme by affinity chromatography were performed. Protein amount was determined according to Bradford method and bovine serum albumin was used as the standard. PPO enzyme was firstly purified by ammonium sulfate precipitation 0-80%, dialysis, and affinity chromatography, respectively. Activity values for catechol, 4 methyl catechol, pyrogallol, chlorogenic acid and caffeic acid were done. Optimum reaction parameters were determined for catechol as 0,1M/ pH:7,2/ 37°C. A significant increase was observed in the pH range between 6 and 9 for the catechol substrate. In affinity chromatography, Sepharose 4B-L-Tyrosine-p-aminobenzoic acid and Sepharose-6B-L-Tyrosine-p-aminobenzoic acid affinity gels were synthesized for PPO enzyme with the result of 147.73 and 154.00 purification folds, respectively. In this way, kinetic results obtained from both gels were compared. SDS-PAGE and Native-PAGE were applied. In SDS-PAGE, 4B isolated PPO bands were observable at 35-50 kDa while 6B isolated PPO bands were clearly observable at 50 kDa, but slightly observable at 35 kDa. In Native-PAGE, clear and slightly clear bands were observable at 50-70 and 100 kDa for both 4B and 6B isolated PPOs. Sepharose 6-B-L-Tyrosine-p-aminobenzoic acid was first synthesized as an affinity gel and avocado PPO was first purified by affinity chromatography in this study [3].

KEYWORDS: Avocado (*Persea americana*), characterization, isolation, affinity chromatography, polyphenol oxidase.

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[OP49]

PREPARATION AND INVESTIGATION OF PVA-CMC-CERIUM OXIDE GEL FOAMS AS A WOUND DRESSING

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In recent years, foams have become popular in the field of wound care. As modern wound care, gel foams have some advantages over traditional foams in terms of their conformability, exudate management capabilities, and enhanced comfort. They are moldable and can fit different shapes of the wounds. They can also effectively manage exudate thanks to the foam channels, where liquid can be trapped by capillary flows [1]. Additionally, gel foams are soft materials that can improve patient comfort. In the present study, a gel foam was developed as a wound dressing. A blend containing polyvinyl alcohol, carboxymethyl cellulose, and cerium oxide nanoparticles was prepared, and borax was added as a crosslinker. Cerium oxide nanoparticles were added to foams to give them an antibacterial quality [2]. The gel foam was created in two processes. First, a homogenizer was used to agitate the solution mixture until it resembled a milk foam. Secondly, in order to create the gel foam, solid-state borax was added to the foam, while the homogenizer remained operational. The physical and chemical properties of the gel foams were investigated. The boron-diol bond that resulted after crosslinking was shown via Fourier Transform Infrared Spectroscopy. The presence of cerium oxide nanoparticles was confirmed by the X-Ray Diffraction analysis. A wound dressing must provide enhanced properties. In this regard, gel foams demonstrated notable properties. They had a maximum swelling capacity of 120% within 8 minutes in citrate-phosphate buffered saline and 284% in 18 minutes in pure water. The drug release ratio of the silver sulfadiazine-loaded foams was 98% after 120 minutes. The gel foams exhibited superior antibacterial activity against *E. coli* and *S. aureus* compared with the control foams, which do not contain cerium oxide nanoparticles. As a result of the experiments yielding the expected outcomes, a potential wound dressing was proposed.

KEYWORDS: antibacterial, borax, carboxymethyl cellulose, gel foam, polyvinyl alcohol, wound dressing

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[OP50]

MACHINE LEARNING-ASSISTED MASS SPECTROMETRY-BASED GLYCOMICS: THE FAST DIAGNOSIS OF GASTRIC CANCER

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Precise diagnosis of diseases is paramount for the effective implementation of targeted therapeutic interventions. Notably, glycosylation patterns undergo distinct alterations during the progression of cancerous tissue development. This study was undertaken with the objective of characterizing *N*-glycan profiles in gastric cancer tissues, leveraging machine learning algorithms for the prospective prediction of gastric cancer occurrence. The (glyco-)proteins within formalin-fixed paraffin-embedded (FFPE) gastric cancer specimens and adjacent control tissues were extracted subsequent to the conventional deparaffinization procedure, utilizing a chloroform/methanol extraction method. The released *N*-glycans were subjected to labeling with a 2-amino benzoic (2-AA) tag. Subsequent analysis of the 2-AA-labeled *N*-glycans was conducted via MALDI-MS in negative ionization mode, leading to the identification of fifty-nine distinct *N*-glycan structures. The relative and analyte areas associated with these identified *N*-glycans were extracted from the acquired dataset. Subsequent statistical analyses discerned noteworthy variations in the expression levels of 14 distinct *N*-glycans within gastric cancer tissues. The data were separated based on the physical attributes of *N*-glycans and subsequently employed for testing within machine-learning models. Remarkably, the multilayer perceptron (MLP) model emerged as the most fitting choice, exhibiting the highest levels of sensitivity, specificity, accuracy, Matthews correlation coefficient, and f1 scores for each dataset examined. Notably, the comprehensive *N*-glycan relative area dataset yielded the highest accuracy score (96.0 ± 1.3), accompanied by an impressive AUC value of 0.98. In summation, this investigation ascertained that mass spectrometry-based *N*-glycomic data could enable the discrimination of gastric cancer tissues from their adjacent control counterparts with exceptional accuracy, thereby holding promise for enhanced diagnostic precision in the context of gastric cancer.

KEYWORDS: Glycomics, gastric cancer, machine learning, diagnosis, mass spectrometry.

[OP51]

URIC ACID ANALYSIS IN BODY FLUID BY A NOVEL BIOSENSOR BASED ON MOLECULARLY IMPRINTED POLYMER COATED NANOFIBER COMPOSITE

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There are biomarkers in sweat and urine that can reveal a subject's level of health. Colorimetric techniques can be used to analyze these biomarkers, which is important for noninvasive tracking without the need to take blood samples. A novel, polymer-imprinted, polymer-coated nanofiber composite was synthesized using a colorimetric technique to noninvasively monitor uric acid in sweat and urine. Then, the new adsorbent has been characterized using SEM and FTIR spectroscopy, the optimization of parameters such as pH, time, and various interference ions' effects was investigated. Results showed that the newly synthesized adsorbent is very selective and efficient for the extraction and determination of uric acid. The method's ability to determine uric acid without interference from nearly all other biochemical compounds present in biological fluids is a noteworthy advantage. Both real and synthetic urine and sweat were measured for uric acid content using the current method and HPLC. The findings were satisfactorily comparable, allowing the suggested method's applicability to actual samples to be verified. Additionally, the sensing device's adaptability and durability allowed for the successful, highly sensitive, and semi-quantitative analysis of uric acid in skin sweats. The colorimetric method's clear feedback is demonstrated in real-time, on-body experiments using healthy human subjects. The described wearable sweat-based monitoring system is dependable and simple to use.

KEYWORDS: uric acid, imprinted polymers, nanofiber, biosensor, sweat

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[OP52]

NONENZYMATIC ELECTROCHEMICAL DETERMINATION OF METRAFENONE IN BIOLOGICAL SAMPLE BASED ON IRIDIUM OXIDE NANOPARTICLE AND IONIC LIQUIDS

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Pesticides are commonly utilized in the field of agriculture for the purpose of managing and regulating populations of insects, fungus, bacteria, rodents, weeds, and other forms of pests [1-2]. Nevertheless, the use of pesticides has been shown to give rise to several health issues due to their ability to function as enzyme inhibitors in human metabolism [3-4]. Metrafenone is a frequently used insecticide within the agricultural sector. Metrafenone has remarkable efficacy in the management of powdery mildew via its ability to impede the regular development of mycelium, which is the fungal component responsible for root invasion [5]. It is widely used in barley, wheat, grapes, melons, cucumbers and many other crops for its preventative and curative properties against product-robbing diseases like powdery mildew and eyespot. Similar to other pesticides, metrafenone has the potential to pose health risks when its use above certain thresholds. In this work, a nanosensor was created to enable rapid and accurate electrochemical detection of metrafenone. The nanosensor was obtained by modifying a glassy carbon electrode with iridium oxide (IrOx) nanoparticles and ionic liquids (ILs). The electrochemical behavior of metrafenone on the designed electrode was examined using adsorptive stripping differential pulse voltammetry (AdSDPV). Under ideal conditions, the nanosensor produced a linear concentration calibration curve extending from 0.6-1.4 mg/L for metrafenone in pH 7.0 phosphate buffer solution, with limits of detection and quantification of 0.07 mg/L and 0.2 mg/L, respectively. The electrochemical nanosensor that was created exhibited notable sensitivity indicating its potential as an innovative and promising platform for the measurement of metrafenone. In addition, the nanosensor was used for the evaluation of metrafenone levels in human serum, with a recovery value of 96%.

KEYWORDS: Iridium oxide nanoparticles, ionic liquids, nanosensor, metrafenone, pesticides.

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[OP53]

SYNTHESIS OF Ag AND TiO_2 NANOPARTICLES MODIFIED POLYACRYLONITRILE NANOFIBERS AS REUSABLE SERS PLATFORM FOR ANALYSIS OF TRACE ORGANIC CONTAMINANTS

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Herein, it is hypothesized that the fabrication of multifunctional polyacrylonitrile (PAN) nanofiber mats with titanium dioxide (TiO_2 NPs) and on-surface photoinduced reduced silver nanoparticles (Ag@PAN-TiO_2 NFs). The new multifunctional material exhibited antimicrobial properties, can self-clean under light due to its photocatalytic feature, and allows the detection of pollutants directly on nanofibers by SERS mechanism due to its plasmonic components. To demonstrate the SERS activity of the obtained nanofiber mats, methylene blue (MB) was utilized as a probe molecule. The analytical enhancement factor (AEF) for SERS analysis was found as $7.14x10^6$. the highly stable and reusable photocatalytic and self-cleaning activities of the mat were examined via the photocatalytic degradation of MB. Moreover, the photocatalytic and self-cleaning properties of the mats were able to monitored from the surface of Ag@PAN-TiO_2 NFs due to it's SERS activity. This novel design integrated hotspot engineering with physical strategies to form new fabrication approaches that further boost plasmonic photocatalysis and SERS ultra-trace analysis for analytes together with antimicrobial applications.

KEYWORDS: Raman spectroscopy, surface enhancement raman spectroscopy, trace analysis, photocatalysis, organic contaminants.

[OP54]

CYTOTOXIC AND GENOTOXIC EFFECTS OF COBALT NANOLEAVES ON DAPHNİA MAGNA

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Nanoparticles may cause environmental issues and detrimental effects on living species, particularly aquatic organisms. This investigation was carried out to examine the cytotoxic and genotoxic effects of cobalt nanoleaves (Co NLs) on freshwater microcrustacean, *Daphnia magna*. Acute and chronic toxicity experiments were carried out based on the standard methodology of the Organization for Economic Cooperation and Development (OECD) 202 and 212 guidelines [1-2]. Using the OECD method (202), different concentrations (1.0-25 mg L^{-1}) of cobalt nanoleaves were subjected to *D. magna* in time periods of 24, 48, 72, and 96 h at 21°C. After 96 hours, the LC_{50} value of Co NLs was determined as 9.705 mg L^{-1}, with a probit analysis. Based on the toxicity levels as determined by the Globally Harmonized System of Classification and Labelling of Chemicals, cobalt nanoleaves belong to the medium toxic category [3]. Moreover, the 96-hour acute toxicity test was used to determine the Safe Application Rate (SAR) and Safety Factor (SAFE) coefficients. For Co nanoleaves, SAFE and SAR coefficients were found to be 0.025 and 0.243, respectively. Moreover, according to ISO10993-5, cobalt nanoleaves were classified as cytotoxic on *D. magna* for the studied concentrations [4].

KEYWORDS: Cobalt nanoleaves, genotoxicity, nanotoxicology, model organism.

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[OP55]

DETERMINATION OF FOREIGN ENZYMES IN HONEY: ADULTERATION DETECTION STUDIES

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β-Fructofuranosidase is an invertase enzyme that catalases saccharose to glucose and fructose. However, it is used by malicious people to adulterate related foods, including honey. Using the enzyme, the inverted glucose and fructose from saccharose were added to the honey to reproduce honey. Alternatively, the shrub prepared in this way was used to feed the bees to produce fake and cheap honey. The foreign invertase (β-fructofuranosidase) mixes with the honey in both cases. In authentic honey, β-fructofuranosidase is absent. Thus, according to Article 5, honey is called adulterated. Because the addition of any external food components and/or compounds into the honey is inappropriate as stated by Article 5, paragraph 1, and subparagraph (a) of the Turkish Food Codex Honey Communique.

One of the quality parameters of Honey is diastase number, which is related to α-amylase amount. It also shows the freshness of the honey. The diastase number should be upper than 8 as stated by Turkish Honey Communique. Normally, the diastase number of any authentic or raw honey exceeds the limits. On the other hand, when honey is kept in inappropriate conditions, and/or heated for uncrystallization, and produced using inverted sugars by bees, its diastase number is lower than limits. In these cases, honey does not meet the criteria of the Communique. For this reason, α-amylase is added externally to meet its criteria for the communique. Moreover, starch-based bee foods are generally prepared by hydrolyzing the starch enzymatically using α-amylase. In this case, foreign α-amylase is transferred to the honey by the bee. The second probability is that bees may convert the foreign α-amylase to γ/β-amylases, which are absent during honey production. In both cases, honey is called adulterated.

The methods suggested by the International Honey Commission (IHC); namely, Fadabas and Shade assays, are not enough to detect foreign α-amylase and foreign invertase. Thus, cheap, reliable, and fast methods were developed in our Natural Products Research Laboratory to detect foreign enzymes, which will be a criterion for detecting adulteration, particularly in exported honey. An HPLC coupled with DAD and RI detectors and having ODS, amine, or GPC columns are enough to determine the adulterations. The study was also confirmed using an SDS page and western blot analysis using an enzyme antibody. The diastase is a quality parameter that is requested in exportation. Therefore, laboratories, and beekeepers, and those in the sector request cheaper and more reliable methods to discriminate the foreign α-amylase adulterations easily.

KEYWORDS: Honey, adulteration, invertase (β-fructofuranosidase), diastase, foreign α-amylase.

ACKNOWLEDGMENTS: The study is supported by TAGEM (Ministry of Agriculture and Forestry of Turkey, General Directorate of Agricultural Research and Policies) with project number 18/AR-GE/64. Turkish Beekeepers Association (TAB) is also acknowledged. The Higher Education Commission of Turkey (YOK) for the YOK 100/2000 thematic scholarship given to C.Ç. is also acknowledged.

[OP56]

SYNTHESIS OF NANODIAMOND WITH LAYERED DOUBLE HYDROXIDE NANOCOMPOSITE AS AN ADSORBENT FOR TOXIC ELEMENT EXTRACTION

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Over the years, various materials like fibers, polymeric resins with ion exchange capabilities, spinel oxides, graphene, silica gels, metal-oxides, molecularly imprinted polymers (MIPs), ionic liquid impregnated sorbents, bio sorbents, as well as metal organic frameworks (MOFs) are most commonly used in numerous research work for the development of microextraction methods [1-5]. In the present work, a novel nanocomposite of Nanodiamond with layered double hydroxide (LDH) was prepared by using the hydrothermal method. The obtained nanocomposite was characterized by XRD, FTIR and SEM methods to get information about the structure, composition, and morphology. After the physicochemical characterization of the adsorbent, it was applied for the trace and toxic elements from the environmental samples. Different optimization parameters such as pH, adsorbent amount, eluent concentration, eluent volume, eluent time and sample volume were optimized for the developed procedure. The LOD and LOQ were determined as 0.62 µg L^{-1}, 2.10 µg L^{-1}, respectively. The validation test was performed by using a certificated reference material. Sample analysis was carried out by using Flame atomic absorption spectrometric detection technique and found good recoveries (≈100%). The obtained results show that the LDH hybrid with Nanodiamond (ND) have exhibited great extraction efficiency, as compared to LDHs or ND. Therefore, these hybrid materials are found to be suitable for Pb (II) to improve extraction efficiency. The authors of this study gratefully acknowledge the financial support from Project No. 121C104, sponsored by TUBITAK 2232-A Program.

KEYWORDS: Flame atomic absorption spectrophotometer, nanodiamonds, certified reference materials, adsorbent, preconcentration factor.

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[OP57]

EXTRACTION OF CURCUMIN FROM WATER AND FOOD SAMPLES USING A NOVEL SWITCHABLE AND REUSABLE DEEP EUTECTIC SOLVENT FOLLOWED BY SPECTROPHOTOMETRIC ANALYSIS

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Curcuminoids, a mixture of curcumin, desmethoxycurcumin, and bisdemethoxycurcumin, are phenolic chemicals that are abundant in the rhizomes and range in concentration from 1-6 %w/w [1]. Among these curcuminoids, curcumin is the compound that is most frequently explored for its properties and uses. Curcumin is a major component of Curcuma species, which is commonly used as a yellow coloring and flavoring agent in foods. Antioxidant, anti-inflammatory, and anticancer actions [2] are just a few of the pharmacological traits that curcumin exhibits. Various methods have been used to measure curcumin up till now. Although each has advantages of its own, UV-VIS spectrophotometry is the most popular detection method because to its great efficiency, simplicity, good dependability, and low cost. In the proposed study, curcumin was extracted by dispersive liquid-liquid microextraction (DLLME) method from various water and food samples, followed by spectrophotometric analysis, using an efficient and novel reusable and switchable deep eutectic solvent (RS-DES) (containing succinic acid, octylamine, and water as the precursors). In contrast to existing synthetic DES, this innovative extractant solution exhibits distinguishing qualities such as rapid extraction time, high extraction efficiency, and removal of harmful organic solvents like THF. The influence of effective parameters (i.e., DES ratio, volume of prepared DES, volume and concertation of NaOH solution, volume of HCl solution, and salt effect) on the extraction procedure were examined. Under optimum conditions, the enrichment factor of 50.0 was obtained. The calibration curve also was linear in the range of 35 to 500 μg L^{-1} with coefficients of determination (R^2) of 0.9976. The relative standard deviations (RSDs %) composed of intra-day RSD (4.7) and inter-day RSD (6.4), and relative recovery of 92.6%-100.3% were achieved. The RS-DES-DLLME technique was proficiently employed to expedite the easy and fast extraction of curcumin from diverse water and food samples.

KEYWORDS: Reusable and switchable deep eutectic solvent, Curcumin, water and food samples, dispersive liquid-liquid microextraction, spectrophotometric analysis.

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[OP58]

A KINETIC STUDY ON THE DEGRADATION OF ASCORBIC ACID IN AN ALKALI MEDIUM USING UV KINETIC SPECTROPHOTOMETRIC MEASUREMENTS

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The stability of pharmaceuticals is one of the main problems in drug research and development studies or preparations of drug formulations. In drug stability studies, degradation is a critical issue in revealing pharmaceuticals' degradation kinetics and reaction mechanisms in their commercial products [1-2]. In this study, the degradation kinetics and mechanism of ascorbic acid in alkali medium were investigated using UV kinetic spectrophotometric measurements.

Ascorbic acid is widely used in commercial food products, food supplements, and pharmaceutical preparations. However, improper storage, processing, and preparation procedures of drugs can cause the degradation of ascorbic acid [3].

The degradation kinetics and mechanism of pharmaceuticals can be affected by several factors such as pH, temperature, solvent, dielectric constant, ionic strength, intensity of light exposure, and excipients [1]. In our case, the rate constant and reaction order in the degradation kinetics of ascorbic acid in the alkali medium were determined using an integrated rate equation. Experimental results were obtained from the average of repetitions at three different ascorbic acid concentrations. In this study, the order of the degradation reaction was determined from the graphical method and found as a first-order reaction. The rate constant for the degradation reaction of ascorbic acid was found to be 4.11×10^{-2} s^{-1}. The results of this study are important because they can be used to determine the shelf life of the active ingredient in ascorbic acid preparations.

KEYWORDS: Ascorbic acid, UV kinetic spectrophotometric measurements, rate constant, degradation.

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[OP59]

SPECTROPHOTOMETRIC QUANTIFICATION OF TOBRAMYCIN AND DEXAMETHASONE IN COMBINED PHARMACEUTICAL USING PLS REGRESSION MODEL

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The treatment of ocular infections involves the use of steroids and antibiotic eye drops, such as tobramycin and dexamethasone [1]. Tobramycin (TB), derived from Streptomyces tenebrarius, belongs to the class of aminoglycoside antibiotics. It is widely used in the treatment of gram-negative infections, with notable activity against several strains of Pseudomonas aeruginosa [2]. Dexamethasone (DX) is a potent glucocorticoid used primarily as an anti-inflammatory and immunosuppressive agent in medical treatments [3]. The chemometric approach, in particular Partial Least Squares Regression (PLS-R), combined with experimental design, has emerged as a powerful solution to the challenge of overlapping spectra in complex mixtures [4].The main objective of this study was to develop, validate and apply a spectrophotometric method incorporating chemometric techniques, including PLS-R and factorial design, for the simultaneous determination of TB and DX. To this purpose, factorial design techniques were strategically applied to generate calibration (25 samples) and validation (8 samples) sets containing mixtures of TB and DX within their linear ranges (25-45 µg/mL for TB and 10-25 µg/mL for DX), facilitating the assessment of factor effects within complex matrices. The spectra of the mixtures and samples obtained were carefully recorded over a range of wavelengths from 200 to 500 nm, with a precise interval of $\Delta\lambda=1$ nm between each measurement point. Following this data collection, PLS-R was applied and satisfactory results were obtained with compound recoveries in excess of 97.69 %. The calibration model showed excellent precision and accuracy, confirming its effectiveness for complex matrix analysis. The validation study, including the evaluation of accuracy, precision and recovery, further confirmed the reliability of the method. This method enabled the accurate identification and quantification of TB and DX in pharmaceutical product, with average TB and DX levels determined to be 14.79 mg ± 0.396 and 5.14 mg ± 0.157, respectively.

KEYWORDS: PLS, factorial Design Tobramycin, Dexamethasone,

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[OP60]

SIMULTANEOUS DETERMINATION OF SOME HEART FAILURE DRUGS BY SPECTROPHOTOMETRIC METHODS AND GREEN ANALYSIS

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Heart failure, a progressive condition, occurs when the heart's ability to pump blood efficiently deteriorates. Sacubitril (SAC) and valsartan (VAL) are angiotensin receptor-neprilysin inhibitors used to reduce morbidity and mortality in patients with chronic, symptomatic heart failure [1]. VAL, (2S)-3-methyl-2- [pentanoyl- [[4- [2- (2H-tetrazol-5-yl) phenyl] phenyl] methyl] amino] (Figure 1) butanoic acid is an angiotensin receptor II blocker. SAC, 4-[[(2S,4R)-5-ethoxy-4-methyl-5-oxo-1-(4-phenylphenyl)pentan-2-yl]amino]-4-oxobutanoic acid (Figure 1) inhibits neprilysin and increases peptide levels, including natriuretic peptides. However, inhibition of neprilysin alone may increase angiotensin II levels. Adding VAL to this helps prevent the harmful effects of angiotensin II [2,3]. Spectrophotometric analysis SAC and VAL were determined by two different spectrophotometric methods. Calibration graphs were constructed in the 2.0 – 20.0 and 2.0 – 20.0 μg/mL SAC and VAL respectively Analysis could be applied for the assay of SAC and VAL in pharmaceutical dosage forms for the routine analysis in every drug analysis laboratory. The aim of the study is to analyze the active substances quickly without the need for pre-separation. The suggested technique was employed with a high degree of precision and accuracy in the quantification of all active compounds. The method was appropriate for the simultaneous determination and it can be applied in the quality control in industries, bio-pharmaceutics and bio-equivalence studies. The method has been evaluated as green analysis.

KEYWORDS: Spectrophotometry, sacubitril, valsartan, determination.

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[OP61]

SYNTHESIS of OXIDASE-MIMETIC MANGANESE OXIDE NANOPARTICLES by $KMnO_4$ REDUCTION USING ASCORBIC ACID AND ITS APPLICATION to DNA OXIDATION

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In recent years enzyme mimetic nanoparticles (NPs) find a large usage area. They are usually called as nanozymes. Manganese is one the most often used elements in NP synthesis. In the presented study a manganese oxide (MnO_x)-based NP was synthesized by reduction of $KMnO_4$ using ascorbic acid. The synthesized MnO_x-NPs were used for DNA oxidation. For this purpose, solid NPs were weighed and mixed with DNA solution (dissolved in pH 10 NH_3/NH_4Cl buffer solution) and incubated in a water bath at 70°C for 30 min. Due to the oxidase effect of NPs, DNA could be oxidized without the need for H_2O_2. The oxidation products of DNA could be determined by using colorimetric CUPRAC method. During application of the method a mixture solution containing NPs and pH 10 buffer was used as reagent blank and spectrophotometric measurements were realized against it. In addition to CUPRAC method another colorimetric measurement was achieved using 3,3',5,5'-tetramethylbenzidine (TMB). As reference methods RP-HPLC and differential pulse stripping voltammetry techniques were used. In voltammetry, a glassy carbon electrode was modified by a combination of AuNPs, multi-walled carbon nanotubes and Nafion [1]. Here, DNA solution (dissolved in the buffer) was incubated in the presence and absence of MnO_x-NPs, these two DNA sample before and after oxidation were injected to HPLC. The voltammetric method was applied same way as well. Therefore, the difference caused by oxidation of DNA was investigated. During these experiments the decrease in peak areas of four DNA bases could be observed. Nevertheless, in the voltammetric studies, decrease in the oxidation peak current of bases could be measured for guanine, adenine and cytosine. The experimental findings obtained by chromatography and voltammetry showed the decrease in the DNA bases caused by MnO_x oxidation, while spectrophotometric methods measured damage products emerged from DNA oxidation.

KEYWORDS: Manganese oxide nanoparticles, nanozymes, oxidases, DNA, CUPRAC, TMB

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[OP62]

A REDOX-BASED APPROACH FOR THE VISUAL DETECTION OF NITROAROMATIC ENERGETIC MATERIALS

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Stimulated by an external factor, energetic materials (explosives, pyrotechnics, propellants *etc.*) suddenly decompose and generate an explosion due to the great amount of chemical energy in their molecular structure. Nitroaromatic energetic compounds consisting of a benzene ring substituted with one or more nitro groups are difficult to determine due to their low vapor pressure and limited reactivity. These electron-deficient compounds can be determined using chromogenic probes thanks to their ability to form δ- and π-donor/acceptor and π-stacking complexes with electron-rich chromophores *via* charge-transfer interactions. Colorimetric methods developed from past to present for the detection of nitroaromatics, especially 2,4,6-trinitrotoluene (TNT), are based on the formation of a Meisenheimer complex as a result of the π-donor/acceptor interactions between the analyte and a chromophore probe in alkaline or neutral media [1,2]. Due to the low tolerance of Meisenheimer complex to water, the operating conditions of these probes are highly solvent-dependent. This situation makes it difficult to work with these probes in aqueous phase for Meisenheimer complexation-based detection of TNT. No other mechanism has yet been proposed for the colorimetric determination of TNT in aqueous media. Recently, computational prediction-based studies have been reported to elucidate the structure of possible end products formed as a result of the alkaline degradation of TNT in aqueous and non-aqueous media [3]. In this respect, a new mechanism based on nucleophilic substitution reaction (addition of hydroxyl to the ring replacing a nitro group in the structure of TNT) in alkaline conditions has been proposed for the detection of TNT. A modified alkaline copper(II) neocuproine colorimetric method, based on the redox reaction between the phenolic species formed as a result of the proposed mechanism and the copper(II) neocuproine chromogenic reagent, has been introduced for this purpose. The major end products, phenolic species and nitrite that are likely to form as a result of the alkaline decomposition of TNT in aqueous phase, were characterized by conventional colorimetric tests (CUPRAC [4] for phenolic species; Griess [5] for nitrite) and advanced analysis techniques.

KEYWORDS: Nitroaromatic compounds, energetic materials, colorimetry.

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[OP63]

GENERATION OF REACTIVE OXYGEN SPECIES BY Fe (II)/Na_2SO_3 AND DETERMINATION USING 3,3′,5,5′-TETRAMETHYLBENZIDINE

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Radicals containing sulfur and oxygen are generally called sulfoxy radicals (SOR). The most well-known of these radicals are $SO_2^{\bullet}$, $SO_3^{\bullet-}$, $SO_4^{\bullet-}$, $O_3SOO^{\bullet}$ [1]. They are produced by transition metal catalysis of S(IV) [2]. Studies in the literature have reported that $SO_4^{\bullet-}$, formed as a result of metal-catalyzed S(IV) autoxidation, causes DNA damage [3]. This radical species causes oxidative damage not only to DNA but also to biomacromolecules such as proteins and lipids [4]. Due to these harmful effects, determination of SOR and their removal are very important. In this study, a colorimetric method inexpensive and easily applied in every laboratory was developed for the determination of radicals thought to be SOR. The method allows the spectrophotometric determination of radicals formed as a result of the reaction between the transition metal ion and sodium sulfite. The produced radicals oxidizes the colorimetric agent tetramethylbenzidine and blue colored diimine complex is released. Within the scope of the study, the main parameters required for radical production such as metal ion concentration, sulfide concentration and pH were optimized. All experiments were performed with 5 repetitions. Firstly, various experiments were carried out to determine the metal ion required for radicals production. It was observed that radicals production occurred as expected with Fe(II) solution.

Optimization Parameters:

Optimization of Fe(II) Concentration: Optimization study was carried out with different concentrations of Fe(II) solution, with the final concentration being 11.8-94.1 µM. The optimal concentration was determined to be 47.05 µM.

Optimization of Na_2SO_3 Concentration: Optimization study was carried out with different concentrations of Na_2SO_3 solution, with the final concentration being 11.8-188.2 µM. The optimal concentration was determined to be 94.1 µM.

pH Optimization: Experiments were carried out in the presence of different pH buffers in the range of pH 3-6, the optimum value was determined as pH 4.

To examine the radical scavenging effect, "Gallic acid (GA)" was used as the antioxidant compound and "White tea" was used as the real sample. The radical scavenging activity of the white tea sample was found 0,341±0,051 mmol GA equiv/g Tea.

KEYWORDS: Sulfoxy radicals, spectrophotometry, transition metal, sulfide, tetramethylbenzidine.

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[OP64]

COLORIMETRIC APPROACHES FOR THE DETERMINATION OF IONIC SPECIES USING NATURAL SOURCES AS GREEN CHROMOGENIC REAGENTS

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Large quantities of organic solvents are consumed within analytical laboratories every year. These solvents lead to the formation of hazardous waste materials that serve as a significant source of emissions of volatile organic compounds (VOCs). As a result, these solvents pose a threat to human well-being and the environment [1, 2]. The US-EPA emphasized that addressing the problem of disposing of hazardous waste generated in academic research should prioritize the reduction in the usage of toxic materials [3]. Therefore, researching sustainable and environmentally friendly methodologies in the field of analytical chemistry has gained importance. Applying sustainable development principles in analytical laboratories can be achieved by employing naturally sourced reagents, such as compounds found in plants, as alternatives to synthetic toxic chemicals [4, 5].

This study investigates the innovative use of natural resources as green chromogenic reagents in spectrophotometric and/or smartphone-assisted colorimetric techniques for the precise determination of ionic species. The incorporation of readily available and environmentally friendly natural compounds into analytical processes represents a significant step towards reducing the environmental footprint of chemical analysis. The use of abundant and renewable natural compounds as chromogenic agents offer a promising path towards environmentally friendly and economically viable analytical chemistry. This approach not only eliminates the need for traditional chemical reagents but also aligns seamlessly with green chemistry principles that emphasize sustainability, safety, and cost-effectiveness. The utilization of natural resources as green chromogenic reagents promises to transform the landscape for ionic species identification and open the way for a more environmentally friendly future in analytical chemistry as the world focuses more significance on sustainable solutions.

KEYWORDS: Green analytical chemistry, natural chromogenic reagents, colorimetry, digital image.

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[OP65]

ELECTROCATALYTIC DETERMINATION OF URIC ACID WITH POLY(TARTRAZINE) MODIFIED PENCIL GRAPHITE ELECTRODE IN HUMAN SERUM AND ARTIFICIAL URINE

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Uric acid (2,6,8-trihydroxypurine, UA) is the end product of purine metabolism in humans, formed by the oxidation of xanthine and hypoxanthine, but is more toxic than these and is omnipresent in urine and blood. The normal range of UA in healthy individuals varies from 1.4 to 4.4 mM in urine and from 240 μM to 520 μM in blood [1]. High level of UA may lead to Lesch-Nyhan syndrome, hyperuricemia, obesity, gout, diabetes, kidney failure and cardiovascular disease, while low level of UA could be linked to Alzheimer, polyarthritis, Parkinson, acromegaly, multiple sclerosis and yellow fever atrophy [2]. Therefore, monitoring the level of UA in human urine or blood is of great importance and pivotal indicator in various fields involving clinical diagnostics, health assessment and monitoring and biological analysis.

Chemically modified electrodes are known to improve electron transfer kinetics over bare electrodes [3-7]. Therefore, a unique, disposable and cheap electrochemical sensor based on a polymer film of tartrazine prepared in a single step was designed and developed for determining UA in human serum and artificial human urine samples in this study. The synthesized polymer film was thoroughly characterized by numerous techniques such as CV, EIS, SEM, EDX and XPS. The formation of a uniform polymer layer exhibited an electrocatalytic oxidation of UA by rising the peak height of about 130% over bare PGE. The produced platform, pTRT/aPGE, reached an outstanding LOD and sensitivity, and wide linear ranges as 0.10 μM, $0.415\ \mu A.\mu M^{-1}.cm^{-2}$, 0.34–60 μM and 70–140 μM, respectively.

KEYWORDS: Electrocatalytic determination, uric acid, tartrazine, human serum, artificial urine.

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[OP66]

RECYCLING OF SPENT LI-ION BATTERIES FOR PRODUCTION OF METAL SULPHIDE AS SUPERCAPACITOR ELECTRODE MATERIAL

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One of the most important energy storage systems in the world is Li-ion batteries. The rapid consumption of resources in the world and the need for energy storage systems make the recycling of spent Li-ion batteries an important issue. In this study, the spent laptop battery (Li-ion) was recycled. For this purpose, the $LiCoO_2$ cathode material in Li-ion batteries was recovered as cobalt sulphide and the produced cobalt sulphide was used as supercapacitor electrode material [1]. First, the batteries were disassembled, and the cathode materials were leached. The leaching process was carried out in acidic environment using H_2SO_4 and H_2O_2. After the leaching process, to obtain cobalt sulphide from the cobalt ions in the solution, the solution was mixed with sodium sulfur solution and cobalt sulphide was obtained [1]. Along with cobalt sulfide, some elemental sulfur precipitation also occurred [1,2]. Characterization processes such as XRD, SEM, XPS and BET were applied to this product. The produced cobalt sulfide was mixed with carbon black and PVDF and coated on graphite foil by the doctor blade method and used as the cathode material for the coin cell type supercapacitor. A mixture of graphite and PVDF was obtained as anode material by coating it on graphite foil using the doctor blade method. 2.0 molar KOH solution was used as electrolyte [1]. The electrochemical performance of the produced supercapacitor was determined with cyclic voltommogram CV, galvanostatic charge-discharge (GDC) and electrochemical impedance spectroscopy (EIS) techniques.

KEYWORDS: Recycling, Li-ion battery, cobalt sulphide, supercapacitor

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[OP67]

EVALUATION AND DETAILED CHARACTERIZATION OF SnO_2-ZnO MIXED NANOPARTICLES IN TERMS OF ELECTRODE MODIFICATION MATERIAL

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In general, hydrothermal synthesis is an eco- friendly process used to create a wide variety of materials, especially nanomaterials, by subjecting precursor materials to controlled temperature and pressure conditions in an aqueous (water-based) environment [1]. In addition, this method can control the size, shape, composition, and crystal structure of the synthesized materials by adjusting factors such as temperature, pressure, reaction time and precursor concentrations. Therefore, this method is a very advantageous method used to create nanoparticles of various compositions by adjusting the precursor materials, allowing the synthesis of complex alloys, oxides, and composites. In this study, SnO_2-ZnO mixed nanoparticles (NPs) were synthesized via the hydrothermal method. The synthesized nanoparticles were fully characterized through Scanning Electron Microscopy (SEM), Conventional Transmission Electron Microscopy (CTEM), Atomic Force Microscopy (AFM), X-ray diffraction analysis (XRD), Brunauer-Emmett-Teller (BET), Thermal gravimetric analysis (TGA), Fourier Transform Infrared Spectroscopy (F-TIR), Contact angle, and Electrochemical Impedance Spectroscopy (EIS) analysis techniques, respectively. XRD analysis results show that the nanomaterial consists of two separate nanocrystal phases, SnO_2 and ZnO. CTEM analysis images support the conclusion that SnO_2 NPs have a tetragonal crystal lattice structure and ZnO NPs have a hexagonal crystal lattice structure. Moreover, BET surface area of the SnO_2-ZnO mixed NPs are 187 m^2/g, which is much larger than those of pure SnO_2 (72 m^2/g) and ZnO (44 m^2/g). By evaluating all these results, the role of SnO_2-ZnO mixed NPs as electrode modification material and their advantages are discussed in depth.

KEYWORDS: Hydrothermal synthesis, SnO_2-ZnO nanoparticles, characterization techniques.

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[OP68]

ADVANCEMENTS IN ELECTROCHEMICAL SENSING FOR THE PRECISE DETERMINATION OF RIBOCICLIB, AN ESSENTIAL ANTICANCER DRUG IN BREAST CANCER TREATMENT

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Breast cancer stands as one of the most prevalent malignancies globally, with millions of individuals affected each year [1]. Among the many therapeutic agents available for breast cancer treatment, Ribociclib (RIBO) has emerged as a crucial player, especially in cases where the cancer is hormone receptor (HR) positive and human epidermal growth factor receptor 2 (HER2) negative [2]. The accurate determination of RIBO concentrations in pharmaceutical formulations and biological samples is paramount for effective clinical management. In this study, we present the development and comprehensive characterization of a novel electrochemical sensor utilizing multi-walled carbon nanotubes (MWCNTs) for the sensitive and precise detection of Ribociclib. The sensor was systematically optimized, focusing on critical parameters such as pH, deposition potential, and cumulative time, to enhance its electrocatalytic activity and expand the linear range for RIBO determination. Our MWCNTs/GCE sensor exhibited exceptional reproducibility and repeatability, ensuring reliable and consistent results. The applicability and feasibility of the sensor for real sample analysis were extensively evaluated by analyzing human serum, urine, and tablet samples using the standard addition method. The obtained percent recovery values demonstrated the sensor's exceptional accuracy and precision. Furthermore, interference studies revealed the sensor's remarkable selectivity, with minimal impact from common interfering substances. The developed sensor displayed a linear range of 0.01 μM to 5 μM, and the limit of detection (LOD) was determined to be 0.69 nM, affirming its high sensitivity for detecting low RIBO concentrations. Our work represents a significant advancement in the field of electrochemical sensing, particularly for the precise determination of Ribociclib, a critical component in the battle against breast cancer. The simplicity, cost-effectiveness, and excellent analytical performance of the MWCNTs/GCE sensor make it a promising tool for diverse practical applications in breast cancer research and clinical settings.

KEYWORDS: Anticancer drug detection, breast cancer treatment, electrochemical sensor, multi-walled carbon nanotubes (MWCNTs), Ribociclib.

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[OP69]

PREPARATION OF pH SENSITIVE PURPLE BASIL EXTRACT ENRICHED BIOPOLYMERIC FILM FOR POTENTIAL FOOD PRESERVATION AND MONITORING OF FOOD FRESHNESS

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Intelligent packaging systems, which use natural sources such as biopolymers and plant extracts to enhance the protection and safety of food has been gained attention over the use of conventional plastics. Biopolymers are safer alternatives with their adjustable physical properties in order to use in food packaging applications. Pectin is a polysaccharide-type biopolymer with a great reputation in the food industry owing to its gelation ability [1]. Sodium alginate, one of the well-known linear, anionic biopolymers, obtained from brown seaweed has a good film-forming ability, water solubility, and high biocompatibility also using for numerous purposes [1]. The addition of natural additives to biopolymeric films generally increases food preservation, and some additions can cause visual alteration of the material, making food spoilage noticeable. Anthocyanins, which are natural and water-soluble pigments can change their chemical structures and thus their color accordingly to the pH. Thus, this phenomenon has been used for the determination of food spoilage with the incorporation of these compounds from different natural sources into the film formulation. The pH value of protein-rich food was reported to be increased with the storage time proportionally with deterioration by microbial growth and proteolysis [2]. In our work, an aqueous plant extract of purple basil was incorporated into the films prepared with pectin and alginate biopolymers to enhance the properties of the film material. Purple basil (*Ocimum basilicum L.*), from the family of *Lamiacaea,* is a plant, rich in essential oils, polyphenols, flavonoids and phenolic acids and especially anthocyanins, and also well-known for its strong antioxidant activity [3]. The antioxidant power and the total anthocyanin amount of the plant extract were examined. Color changes of the natural purple basil extract were monitored within the pH range of 2.0 to 12.0 and the respective color changes of the films prepared with extract were successfully used for the assessment of food freshness. The color change from distinct purple to green was observed for the films stored with food in different conditions with time. The spectroscopic and physical properties of the prepared film as well as optical properties such as UV-light blocking ability were also investigated and found to be that material has an excellent UV light barrier property but is still visible light transparent enough to examine the product. The prepared material is low-cost and environmentally friendly, and it is a promising intelligent food packaging with a natural pH indicator system.

KEYWORDS: Biopolymer, Purple Basil, Anthocyanin, Antioxidant, Food Safety.

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[OP70]

CHEMICAL COMPOSITION OF *LACTARIUS SALMONICOLOR* EXTRACT CYTOTOXIC TO LnCap CANCER CELL LINES

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Mushrooms increasingly become important in the human diet due to their nutritional, pharmacological, and organoleptic properties [1]. Edible mushrooms are rich in minerals and have high water, protein, fiber, and carbohydrate contents and low fat/energy levels, making them excellent food for low-calorie diets [1]. Thus, mushrooms are valuable nutrients due to their ingredients. The mortality rate due to cancer diseases in Turkey is 29%, and cancer is the second leading cause of death after cardiovascular diseases. The mortality rate due to cancer diseases is close to the rate in our country worldwide. Mushrooms, thought to play an important role in the treatment of diseases, including cancer, have attracted great interest in developed countries, in the last two decades. The fact that mushrooms are important sources of modern medicine due to their anti-cancer and immunomodulatory properties [2].

In this study, *L. salmonicolor* was dried and extracted with petroleum ether. The cytotoxic activity of the extract against prostate (LNCaP) cancer cell lines and toxicity against human embryonic kidney cells (HEK293) line were determined by the MTT method. Petroleum ether extract having high cytotoxicity was fractionated over silica gel. The fractions obtained were tested against the same cancer cell lines. Fractions having high cytotoxicity were re-fractionated over silica gel. Petroleum ether main extract, fractions, and sub-fractions were derivatized to their silyl derivatives and analyzed using GC-MS.

In GC-MS analysis, only fatty acids were detected in the petroleum ether extract, while steroid and diterpene skeletal structures were identified in the cytotoxic fractions. In the latest fractions, which were polar, compared to previous subfractions Desmosterol and 3β-Ergosta-4,6,22-trien and conjugated linoleic acid were detected. The fact that polyunsaturated fatty acids and steroidal compounds, when together in the same media, may show cytotoxic activity was reported [3,4]. Therefore, it was evaluated that the cytotoxic activity of the apolar extract of *Lactarius salmonicolor*, which is an edible mushroom, was due to its polyunsaturated fatty acids and steroidal compounds.

KEYWORDS: *Lactarius salmonicolor*, cytotoxic activity, GC-MS, fatty acids, steroids

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[OP71]

POLYMER-BASED CATALYTIC MOTORS FOR CANCER CELL RECOGNITION

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Breast cancer is one of the most mutual and high incidence rate diseases in the major threat of the women's health. The reason why breast cancer is one of the most common lethal diseases is that the current treatments are not accessible to everyone and are not effective as expected [1,2]. Current studies have focused on the novel diagnosis platforms to ensure accurate, rapid and early detection. In this field, effective use of nanomotors and micromotors can provide certain advantages over routine breast screening. Micro/nanomotors are innovative materials that can convert energy into the movement and thus, they have occupied an important place in various fields such as medicine, transportation, isolation and sensing. With their ability of controlled and strong movement without stirring, they can be used as promising analytical tools in order to recognize or interact with (bio)molecules [3,4]. Keeping this point in mind, preparation, characterization and biomedical application of poly(3,4-ethylenedioxythiophene)/poly(3,4-ethylenedioxythiophene) carboxylic acid (PEDOT/PEDOT-COOH)-based (as the outer layer) tubular motors are demonstrated in this study. Inner layers of the motors were made of platinum (Pt), Pt-nickel (Ni) and Pt for the catalytic and magnetic control. Functionalization of the motors were carried out by antiHER2 antibody immobilization. These functionalized machines were then utilized to recognize breast cancer cell lines (MCF-7). Characterization experiments were performed by using scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX) and electrochemical techniques.

KEYWORDS: Catalytic motor, breast cancer, cell recognition.

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[OP72]

PRECONCENTRATION OF Pb(II) AND Cd(II) WITH COOMASSIE BRILLIANT BLUE G-250 DYE MODIFIED SILICA GEL PRIOR TO FAAS DETERMINATION

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The accurate and precise determination of elements at trace levels is an important problem for analytical chemists. The low quantities of analytes and matrix interferences in real samples restrict their applications. So, a separation and preconcentration technique is often required to overcome these limitations prior to determination [1,2]. In this study, a novel solid phase extraction sorbent was prepared, characterized, and used for preconcentration of the Pb(II) and Cd(II). The sorbent was prepared by modification of silica gel with Coomassie Brilliant Blue G-250 dye. Characterization of the sorbent was succeed by FT-IR and SEM analysis. Accordingly, the sorbent was utilized for the preconcentration of Pb(II) and Cd(II) from aquatic environment prior to flame atomic absorption spectrometric (FAAS) determination. The parameters effective for sorption (sample flow rate, mass of sorbent, and sample volume) and elution (eluent flow rate, concentration, and volume) were optimized with chemometric approach. The optimized working conditions for simultaneous separation and preconcentration of the analytes were 3.4 mL min^{-1} sample flow rate, 0.59 g mass of sorbent and 50 mL sample volume at pH 5.0 for sorption. Similarly, the optimized desorption parameters were determined as 3.4 mL min^{-1} eluent flow rate, 0.41 mol L^{-1} HCl eluent concentration and 6.3 mL eluent volume. The optimized preconcentration method was successfully applied for the analysis of various water based samples. The accuracy of the method was proved by the analysis of Ontario Lake Water certified reference material.

KEYWORDS: Solid phase extraction, flame atomic absorption spectrometry, lead, cadmium, silica gel.

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[OP73]

MAGNETIC DISPERSIVE SOLID PHASE EXTRACTION OF CHROMIUM AND COPPER AND DETERMINATION WITH FLAME ATOMIC ABSORPTION SPECTROMETRY

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The vital importance of trace metals for biological systems and the environment led to develop fast, sensitive, feasible and accurate preconcentration and determination methods [1,2]. Consequently, Comassie brilliant blue G-250 dye modified magnetic Fe_3O_4 sorbent (CBB@Fe_3O_4) was synthesized and characterized. The synthesized CBB@Fe_3O_4 sorbent was characterized using FT-IR spectrometer and SEM monitoring. It was used for the separation and preconcentration of Cr(III) and Cu(II) ions from the water-based samples. Determination of the analytes were achieved using flame atomic absorption spectrometer (FAAS). Central composite design (CCD) was utilized for the optimization of parameters for sorption and elution. The optimized values for sorption were given as follow: pH 5.4, 0.0500 g sorbent amount, and 30 s sorption time. Similarly, the optimized elution values were given as follows: 62 s elution time, 4.3 mL eluent volume and 1.1 mol L^{-1} HNO_3 eluent concentration. The sampling frequency was obtained as 40 for the improved method. Foreign ion interference experiments were carried out. The tolerance limits were determined as 5000 fold for Na+, Ca^{2+}, K^+, Mg^{2+}, and SO_4^{2-} ions and 1000 fold for PO_4^{3-} ion higher than the analyte concentration. The limits of detection (LODs) of the improved method were calculated as 4.00 and 9.00 µg L^{-1} for Cr(III) and Cu(II) respectively.

The method was validated by TMDA 53.3 (Ontario Lake Water) certified reference material. The recovery percentages were found as 102.3% for Cr(III) and 99.4% for Cu(II).

KEYWORDS: Magnetic materials, separation and preconcentration, chromium, copper, flame atomic absorption spectrometry

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[OP74]

FENTON-LIKE PHOTOCATALYTIC DYE DEGRADATION WITH BIOPOLYMERIC MATRIX WITHOUT USING H_2O_2

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Advanced oxidation technologies (AOTs) in wastewater treatment are the methods that have been used effectively in recent years [1]. Through AOT, toxic pollutants are broken down by reactive free radicals. In this regard, the hydroxyl radical (·OH) is the most prominent radical. One of the most widely used AOT technologies in wastewater treatment is Fenton reactions, which are based on the production of hydroxyl radicals with H_2O_2 and iron (II) salts. In heterogeneous Fenton catalysis prepared by immobilizing iron ions in a matrix, the sludge problem resulting from photodegradation is eliminated. However, using H_2O_2 in the Fenton reaction increases the cost of the process. This study aims to create a photocatalytic material by cross-linking the composite biopolymer prepared with alginate and carboxymethyl cellulose with Fe (III) ions. The photocatalytic effect of the created material under UV light was examined by removing the malachite green dye. The mechanism of photocatalytic degradation is based on the photochemical properties of Fe (III)-hydroxyl complexes formed in the pH range of 2.5 -5 [2,3]. When exposed to UV light, these species can produce hydroxyl radicals and Fe (II) ions. The formed Fe (II) ions are re-oxidized to Fe (III) by oxygen dissolved in water. As the redox circle of Fe (III)/Fe (II) is completed, hydroxyl radical is produced from various circle reactions. The bio-composite material containing Fe (III) ions, by optimizing the pH of the environment, cross-linker concentration, and UV light range, degraded 98.8% of the dye in 30 minutes without requiring H_2O_2 [4]. The biopolymer composite material prepared in the study has the potential to be used in the photodegradation of different pollutants.

KEYWORDS: Photodegradation, Fenton-like reactions, Advanced oxidation technologies, Dye, Polysaccharide,

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[OP76]

PREPARATION AND INVESTIGATION OF CHITOSAN FILMS INCORPORATED WITH BEE BREAD EXTRACT AS AN ACTIVE FOOD PACKAGING MATERIAL

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The utilization of natural, biodegradable, and bioactive polymers in food packaging as an eco-friendly alternative to synthetic polymers has attracted great interest over the years. Polysaccharides, which have a wide range among biopolymers, have been the subject of much research recently. Chitosan is one of the most widely used polysaccharides in the production of food packaging films. Our group has recently carried out the preparation of chitosan films by blending bioactive agents and natural extracts from plants [1-3]. Bee bread is considered an important source of bioactive compounds with antioxidant, antibacterial, anti-inflammatory, hepaprotective and anti-carcinogenic activities, the production and consumption of which have increased rapidly in recent years. Although many different natural ingredients have been added to food packaging in the literature, no study has been found in the literature about the investigations on the chitosan film incorporated with bee-bread extract. In the present study, a chitosan-based film, which was incorporated with bee bread, was produced by solution casting technique. Since the bee bread incorporated chitosan films are not soluble in water, no cross-linking agent was used. The physical and antibacterial properties of both plain biopolymer film and bee-bread extract incorporated film were measured and compared. The chitosan films, which are incorporated with bee bread extract, exhibited superior antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* compared to the control films. Moreover, the mechanical properties were determined by applying a tensile-strength test. According to the results of the tensile-strength test, it is observed that bee bread extract incorporation into the chitosan film increased the strength. The antioxidant properties imparted to the films by the addition of bee-bread extract were determined by the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) inhibition method. The antifungal activities of films were investigated by observing the fungal growth incidence on phyllo samples packed with pure chitosan, bee bread extract incorporated chitosan films and low-density polyethylene. In light of the results that were obtained from the physical and chemical test of the bee bread incorporated chitosan film, it can be recommended as food packaging material.

KEYWORDS: Bee bread, chitosan, food packaging, antibacterial, antifungal.

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[OP77]

CYTOTOXIC ACTIVITY OF *LEPISTA PERSONATA* (FR.) COOKE MUSHROOM WITH CHEMICAL INGREDIENTS

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Cancer is the most common disease currently worldwide. The most diagnosed cancer in the world is female breast cancer (11.7%), lung (11.4%), colorectal (10.0%), prostate (7.3%), and stomach (5.6%) cancers [1]. The use of natural products might have a preventive effect against cancer cells. Mushrooms are rich in biologically active compounds that play important roles against cancer diseases. Extracts of some types of edible mushrooms have shown activity against breast cancer cells [2], colon cancer [3], and prostate cancer cells. The studies indicate that mushrooms have potential compounds that may be used against cancer.

Lepista personata is an edible mushroom that belongs to the *Tricholomataceae* family, and is used for medicinal purposes. Firstly, extracts of petroleum ether, acetone and methanol, as well as hot water extracts were prepared from *Lepista personata* collected from Almaty, Kazakhstan. Herein, the cytotoxic activity of the apolar extract of *Lepista personata* against lung (H1299), breast (MCF-7), prostate (LNCaP), and colon (Caco-2) cancer cell lines and kidney (HEK293) healthy cell lines were studied. Then, the chemical ingredients of the bioactive extract were elucidated using GC-MS after silylated with pyridine and Bis(trimethylsilyl)trifluroacetamide. In the conducted studies, the petroleum ether extract of *Lepista personata* exhibited significant cytotoxic activity against Caco-2 (EC_{50}: 198.77 µg/ml), LnCap (EC_{50}: 152.06 µg/ml), and MCF-7 (EC_{50}: 98.37 µg/ml). GC-MS analyses revealed that the apolar extract contains mostly fatty acids. The fractionation also afforded that the apolar extract contains steroidal compounds having cytotoxic activity. According to the literature, the steroid's cytotoxic activity increases in the polyunsaturated fatty acids media [4,5]. It can be concluded that the steroidal compounds, which are minor ingredients of the extract, are responsible for the cytotoxic activity and the polyunsaturated fatty acids triggered the cytotoxic activity.

KEYWORDS: *Lepista personata*, cytotoxic activity, colon (Caco-2) cancer cells, prostate (LnCap) cancer cells, human breast (MCF-7) cancer cells, lung (H1299) cancer cells, kidney (HEK293) healthy cell line.

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[PP1]

SIMULTANEOUS DETERMINATION OF ANTIBIOTICS IN CHICKEN MEAT BY HPLC/UV AND VERIFICATION BY LC-MS/MS

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The use of antibiotics as feed additives to promote growth and prevent disease in livestock is a widespread but contentious practice [1]. Consuming foods that contain antibiotics can pose risks to the health of consumers, as these products may induce allergic reactions, contribute to the development of pathogen resistance to antibiotics, have potentially harmful microbiological effects, and cause carcinogenic or teratogenic effects [2]. Antibiotics in animal feed are controlled by the World Health Organization and the European Union through the establishment of maximum residue levels. These limits vary from hundreds of µg/kg to several ng/kg [3]. It is crucial to identify, detect and measure antibiotic residues in food.

The antibiotics utilized in this investigation are from the tetracycline (tetracycline, oxytetracycline, chlortetracycline), amphenicol (chloramphenicol), quinolone (enrofloxacin) and beta-lactam (penicillin G) families. The aim of this study was to create an extraction technique capable of extracting six antibiotics, from four distinct classes, side-by-side and a HPLC/DAD method to establish the residue amounts in chicken breast meat. The results were later verified using the LC-MS/MS method. The antibiotics residues were extracted by using the traditional solid-liquid extraction method with citric acid in methanol. The average recoveries were between 75.68% and 101.3%.

The developed HPLC/DAD method demonstrated excellent linearity within the studied concentration range. The HPLC/DAD displayed a relative error between -10.8 and 12.0% for accuracy and a relative standard deviation between 0.82 and 10.1% for precision. The LOD of the analytical method varied between 0.6 and 2.7 µg/kg whilst the LOQ ranged from 2.0 to 8.9 µg/kg for five antibiotics. In the case of penicillin G, the LOD and LOQ were found to be 0.16 and 0.52 mg/kg, respectively. The methods developed were used for the analysis of antibiotic residues in eleven samples of chicken breast meat, labelled from A to M. The findings revealed that CAP residues were present solely in sample B, whilst OTC residues were found in sample L exclusively. The results showed that the concentrations determined by HPLC/DAD and LC-MS/MS for CAP and OTC in samples B and L, respectively, were not significantly different at the 95% confidence level. In conclusion, the developed extraction and HPLC/DAD methods can be used reliably for the determination of antibiotic residues in complex matrices. [4].

KEYWORDS: chicken meat, tetracyclines, chloramphenicol, enrofloxacin, penicillin G, HPLC-DAD

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[PP2]

LIPSTICK DYES ANALYSIS - UNIVERSAL MOBILE PHASE FOR TLC

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Lipsticks are one of the most used colour cosmetics. The main components of lipsticks are oils and waxes, as well as natural and synthetic dyes (approx. 8%), which, when mixed in various proportions, give them colour. The composition of lipsticks causes that colour traces (in the form of lip prints or smudges) are often transferred from the lips to various surfaces (dishes, cutlery, clothes, people). These traces, e.g. on cups, napkins or clothes, can be found during the crime scene inspection and become evidence that connects the suspect with the victim or crime scene. Therefore, there is a need to develop simple and effective methods for distinguishing and identifying lipstick samples [1, 2]. A large variety of this type of cosmetic products, and at the same time a similar composition of them, pose a great challenge during identification. Thin-layer chromatography gives the ability to quickly distinguish and identify the components of even small samples, with low effort and costs. The aim of this research was to check the possibility of using thin-layer chromatography to distinguish and identify lipsticks dyes, using one universal mobile phase for all lipsticks, regardless of lipstick colour and brand [3].

KEYWORDS: TLC, dyes, lipstick analysis.

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[PP3]

IDENTIFICATION AND DETERMINATION OF GENOTOXIC IMPURITIES USING GC-MS AND LC-MS/MS

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While producing active pharmaceutical ingredients (APIs), many different components will be used to manufacture the final drug product. Many of these materials and/or their by-products have toxic properties and are considered impurities in the resulting outcome [1]. The main concern connected to genotoxic impurities follows from the production of active ingredients that would force one to use a reactive agent that could react with human DNA to cause cancer or mutation even at very low levels. These Potential Genotoxic Impurities (PGIs) are possible carcinogenic agents causing genetic mutations, chromosomal defects, and chromosomal changes in humans [2]. To guarantee the safety of drug use, the European Medicines Agency (EMA), the United States Food and Drug Administration (FDA), and the International Council for Harmonization (ICH) published applicable guidelines on the control of PGIs in APIs [3-5]. Alkyl mesylate esters of alcohols with short chain are reactive, genotoxic and possibly carcinogenic agents. Currently, the possible health threats of trace amounts of mesylate esters, including methyl methanesulfonate (MMS), ethyl methanesulfonate (EMS) and isopropyl methanesulfonate (IMS) in pharmaceuticals have garnered the attention of regulatory authorities. Genotoxins are limited to a daily dose of 1.5 µg/day according to the ICH guidelines from the EMA [6]. Moreover, several recalls of sartan therapeutics, including Irbesartan, Valsartan, and Losartan were triggered due to the presence of 5-(4'-(Azidomethyl)-[1,1'-biphenyl]-2-yl)-1H-tetrazole (GTI-azide-2). In addition, azido impurities are known mutagenic impurities, which need to be controlled as per the ICH M7 guidelines regarding safe human consumption. Formation of azido impurities is possible during the synthesis of sartan APIs containing a tetrazole ring [7]. In this study, a simple and sensitive GC-MS method has been developed and validated for the trace analysis of mesylate esters (MMS, EMS, IMS) in pharmaceuticals and LC-MS/MS method was developed and validated for GTI-azide-2 impurity of valsartan API. Linearity was demonstrated to be 10.0 - 500.0 ng/mL for mesylate esters and 1.0 – 100.0 ng/mL for the GTI-azide-2 impurity ($r2=0.999$). The limit of detection and the lower limit of quantification results were found as 0.2 ng/mL and 10.0 ng/mL for mesylate esters and 0.1 ng/mL and 1.0 ng/mL for GTI-azide-2 respectively. The validations have been conducted according to ICH guidelines. The methods presented here can be successfully used in quality control laboratories for the identification and determination of unexpected genotoxic impurities during the synthesis of APIs.

KEYWORDS: Genotoxic Impurities, Mesylate Esters, Sartans, GC-MS, LC-MS/MS, APIs.

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[PP4]

AN EXPERIMENTAL APPROACH FOR THE HEADSPACE EXTRACTION OF LIMONENE FROM RECYCLED POLYETHYLENE PLASTICS

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Plastic waste recycling has become an important industry in the worldwide, supporting to solid waste management. Although millions of tons of plastic waste are converted into various products such as plastic cutlery, bags and other goods, one of the most important factors limiting the applications of recycled plastics is their unpleasant odor [1,2]. The unpleasant odors in the recycled plastic resins are orginated from volatile organic compounds (VOCs) which evaporate or sublimate at near room temperatures from the resins and produce odors that intensify as temperatures are raised. It is difficult to identification and monitoring of these volatile compounds, because they could come from various and frequently changing sources of the recycled plastics. Especially, many common odorous VOCs in recycled plastic resins produce an odor noted as "fruity" such as *d*-limonene, which naturally occurs in citrus fruits and is widely used as a fragrance and flavor agent in various foods and household products [3]. In this study, a headspace gas chromatography- mass spectrometry (GC-MS) method was optimized by chemometric approach to determine *d*-limonene from odorous recycled high-density polyethylene (HDPE) plastic resins. A central composite design (CCD) was used for evaluation and optimization of various headspace parameters affecting the chromatographic response of *d*-limonene, such as oven temperature (°C), vial equilibrium time (min), injection time (min) and pressurization time (min). The best analytical conditions for the determination of *d*-limonene from recycled HDPE resin were found to be an oven temperature of 120 °C, a vial equilibrium time of 30 min, an injection time of 1.21 min and a pressurization time of 0.05 min.

KEYWORDS: Head-space, GC-MS, limonene, recycled polyethylene, chemometry

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[PP5]

SCREENING OF CLOVE OIL ADULTERATION BY SPECTROPHOTOMETRIC AND CHROMATOGRAPHIC METHODS

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The essential oil isolated from the buds of clove (*Eugenia caryophyllata*) is widely used and well known for its medicinal properties, such as antimicrobial, antioxidant, antifungal, and antiviral activities, clove oil possesses anti-inflammatory, cytotoxic, insect repellent, antiseptic, and anesthetic properties [1, 2]. An active and major component of clove oil is Eugenol (4-allyl-2-methoxy phenol) (EUG) and its approximate amount is more than 50% of the total content [3]. This work is focused on determining adulteration for commercial clove oil authenticity. Within this scope, eighteen commercial clove oils (100% pure-certified and other clove oils), probable adulterating vegetable oils (sunflower and corn oils) and pure clove oil mixed with sunflower and corn oils at levels of 5, 10, 15, 20, 30, 40, and 50% were studied. Online RP-HPLC analysis with post column detection using CUPRAC (Cupric Reducing Antioxidant Capacity) [4] were used to determine EUG contents and individual antioxidant capacities. The analytical parameters for EUG were validated. EUG contents were calculated in the range of 1.46 to 80.49 mg/g in commercial clove oils and 39.38 to 77.55 mg/g in synthetically adulterated samples, The antioxidant capacities by the online HPLC-CUPRAC method were in the range of 24.41 to 530.10 μmol/g trolox equivalent in commercial clove oil samples. Spectrophotometric TAC (Total Antioxidant Capacity) values by applying CUPRAC [5], ABTS [6] methods and TFC (Total Phenolic Content) values by applying Folin Ciocalteu's assay [7] were obtained for oil samples. A significant decrease was observed in the TAC values of virgin clove oil obtained using the online HPLC-CUPRAC method, depending upon the type and ratio of adulterating oil. The experimental findings were statistically evaluated by chemometric methods. This method can be an alternative and specific analysis for the authentication and quality determination of commercial clove oils.

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KEYWORDS: Clove oil, authentication, online HPLC-CUPRAC assay, adulteration.

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[PP6]

ESTIMATION OF XYLOMETAZOLINE HCL AND BENZALKONIUM CHLORIDE IN COMMERCIAL NASAL SPRAY BY REVERSE PHASE HPLC ASSAY METHOD

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Nasal drug formulations for local application are widely used as over-the-counter products for such frequently occurring diseases as the common cold and hayfever. They are used to apply and deliver drugs locally in the nasal cavities for local or systemic effects, such as allergic rhinitis and nasal congestion [1]. Some chemical compounds are added to prevent possible infections owing to contamination during therapy. Benzalkonium chloride (BZC), potassium sorbate, chlorbutol, chlorhexidine, and sodium metabisulfite are some of the chemicals that can be used as preservatives in nasal preparations. BZC is the most frequently used chemical among all, since it has strong germicidal [2]. Xylometazoline hydrochloride, is a derivative of imidazoline, nasal spray is a topical decongestant that has been used successfully for many years and is generally recognized as an effective and safe for therapy [3].

A rapid, simple, precise and sensitive high performance liquid chromatographic method has been validated for the simultaneous determination of Xylometazoline Hydrochloride and Benzalkonium Chloride in nasal dosage form. Chromatography was carried out at room tempetature on a GL Science Intersustain 250 mm x 4,6 mm C18, 5 microns column using a mixture of Acetonitrile: Sodium Perchlorate Solution 80:20 (v/v) as the mobile phase at a flow rate of 1.0ml/min, the detection was carried out at 210 nm. The parameters for validation such as respectively for Xylometazoline Hydrochloride, Benzalkonium Chloride linearity ($r > 0.9982$,$r > 0.9967$), precision (RSD: 2.273%, 0.298%) reported. The statistical parameters were found to be satisfactory, with recovery values ranging from 98.77 to 101.67% (RSD: 0.07–0.59%) for Xylometazoline Hydrochloride. Recovery values ranging from 99.46 to 102.31% (RSD: 0.33–0.92%) for Benzalkonium Chloride also have been reported. The method is simple and accurate and therefore suitable for the simultaneous determination of these compounds in dosage form.

KEYWORDS: Xylometazoline hydrochloride, Benzalkonium Chloride, HPLC, assay, validation.

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[PP7]

DETERMINATION THE TOTAL PETROLEUM HYDROCARBONS IN WATER SAMPLES BY SPME-GC/MS

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Solid-Phase Microextraction (SPME) is a sample preparation technique that is often used for the determination of Total Petroleum Hydrocarbons (TPH) in water samples. SPME involves the use of a sorbent-coated fiber that is inserted into the sample, where it selectively adsorbs the target compounds. The fiber is then thermally desorbed and analyzed by a separation and detection by Gas Chromatography - Mass Spectrometry. It is an important tool for with monitoring contamination and forensics of oil spillage. From environmental point of view there is a great complexity to establish polluters of oil spill accidents. An environmentally friendly approach to TPH determination, using non-toxic reagents during the analysis, such as gas chromatography (GC), enables the detection of TPH compounds in water samples fast and effectively. Nowadays GC is becoming increasingly popular due to growing concerns about the environmental impact of traditional TPH analysis methods and the need for more sustainable solutions in environmental monitoring and analysis [1].

In this case solid-phase microextraction (SPME) is one of the most popular method for TPH determination [2] and covers following key areas of research: 1) Reduced sample volume: SPME requires only a small sample volume, making it ideal for samples with limited availability (extraction of analytes by a thin 100 µm polymeric film coated to a thin quartz rod (fiber); 2) No organic solvents: SPME eliminates the need for organic solvents (no salts and pH are used), reducing the environmental impact of the analysis and minimizing the generation of hazardous waste; 3) Improved sensitivity: SPME can selectively extract and concentrate target compounds, leading to improved sensitivity compared to other sample preparation techniques; 4) Ease of use: SPME is a simple and fast sample preparation technique (extraction time 600 s), making it suitable for routine laboratory analysis.

The investigation herein pertains to the extraction of hydrocarbons from water samples, employing Miniaturized Solid-Phase Microextraction (mini-SPME) methodology, where a specialized fiber coating is introduced into the headspace above the water samples. Subsequently, the petroleum hydrocarbons are desorbed from the fiber coating within the injection port of a gas chromatograph for analytical evaluation. The optimization process yielded a methodological protocol featuring the utilization of a 100 µm polydimethylsiloxane fiber coating, an extraction duration of 5 minutes an extraction temperature of 60°C and sample volume is 200 µL without the addition of salt, within a basic pH environment.

The gas chromatograph was outfitted with a split/splitless inlet configured to operate in splitless mode and was coupled to a 30 m x 0.250 mm DB-35MS column with a film thickness of 0.25 µm (Agilent, USA).Helium was employed as the carrier gas at a constant flow rate of 1 mL/min. The temperature program for the GC oven involved an initial hold at 40°C for 10 minutes, followed by a linear heating ramp to 240°C at a rate of 20°C/min, with a subsequent hold at 240°C. Mass spectrometric detection was executed using a scanning mode, scanning ions across the m/z range of 34-750.

Research focused on development and application SPME to TPH determination in water. Study aimed to improve the accuracy and efficiency of TPH analysis while reducing the environmental impact of the process.

KEYWORDS: total petroleum hydrocarbons, solid-phase microextraction, green method, gas chromatography mass spectrometry.

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[PP8]

CHROMATOGRAPHIC ANALYSIS OF EXTRACT OF KARATAU ERYNGIUM (*ERYNGIUM KARATAVICUM ILJIN*)

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Plant extracts are widely used and are of great interest as effective and environmentally friendly biopesticides, as well as antiprotozoal, antimicrobial, and anticancer agents [1]. The growing popularity and effectiveness are largely due to the content of biologically active substances in them. Agriculture is increasingly recognizing the overall potential and prioritizing biopesticides in the treatment of many grape diseases. In this regard, the search for new types of plant extracts is a very urgent task.

The flora of Kazakhstan has great potential as a source of promising raw materials to produce biopesticides. Medicinal plants serve as a valuable raw material to produce biopesticides with a wide spectrum of antimicrobial activity, which are fast-acting and do not have cumulative properties [2, 3]. It is also known that many promising plant species for the development of biopesticides have been little studied from the standpoint of botanical resource science. These plants also include species of the genus *Eryngium*.

The *Eryngium* is a genus of perennial (rarely biennial and summer) herbs of the *Apiaceae* family [4]. The *Apiaceae* family contains about 450 genera and 3,700 species worldwide. Members of the *Apiaceae* possess various compounds with many biological activities. Some of the main properties are the ability to cause antibacterial activity. *Eryngium karatavicum Iljin* - thorny herbs of the *Umbellíferae* family, spontaneously growing on stony pastures and dry meadows, mainly on calcareous substrates. In this work, we utilized GC/MS to analyze the chemical composition of an extract obtained using different concentration of ethanol (96%, 80% and 70%) as the extractant and ultrasound (Stegler-6DT, 40 kHz) as the extraction technique during 60 minutes by the 30°C. The samples were analyzed by gas chromatography with mass spectrometric detection (7890A/5975C). Analysis conditions: injected sample volume 1.0 µl, sample input temperature 250 °C, splitless. Separation was performed using a chromatographic capillary column DB-WaxExt with a length of 30 m, an inner diameter of 0.25 mm and a film thickness of 0.25 microns at a constant carrier gas velocity (helium) of 1 ml/min. Chromatography temperature is programmed from 40 ° C with a heating rate of 5 ° C/min to 280 ° C (5 min exposure). The analysis time is 53 minutes. Detection was performed in the m/z 34-750 scanning mode. The Agilent MSD Chemical Station (version 1701EA) was used to control the gas chromatography system, registration and processing of the results and data obtained. Data processing included determination of retention times, peak areas, as well as processing of spectral information obtained using a mass spectrometric detector. The Wiley 7th edition and NIST’02 biotechs were used to arrange the obtained mass spectra.

The chemical composition of the *Eryngium karatavicum Iljin* extract showed the presence of a falcarinol component with antifungal properties, as well as a smaller contribution of acetic acid, phytol, β-bisabolene, cyclohexene-3-(1,5-dimethyl-4-hexenyl)-6-methylene. The maximum concentration of falcarinol (17%) was achieved by extraction with 70% ethanol.

Based on the analysis of the studied works, there is a need to develop biopesticides from raw materials of endemic plant species in Kazakhstan. Chemical and biological study of the properties of extracts, the search for new types of biologically active substances, the development of biopesticides from raw materials of the endemic species *Eryngium karatavicum Iljin* is of great importance in the development of the agricultural industry.

KEYWORDS: *Eryngium karatavicum Iljin*, plant extracts, biopesticides, falcarinol, gas chromatography mass spectrometry.

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[PP9]

DETERMINATION OF THE NUCLEIC ACID CONSTITUENTS IN EDIBLE MUSHROOMS BY LIQUID CHROMATOGRAPHY

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Edible mushrooms contain many different bioactive compounds such as polysaccharides, steroids, phenols, terpenoids and nucleosides. These are known to have various benefits for human health [1]. Nucleosides such as cytidine, uridine, adenosine, guanosine, thymidine and inosine have been reported to be involved in the regulation and modulation of various physiological processes in the human body through purinergic and/or pyrimidine receptors [2]. Due to the remarkable reservoir of nucleosides in mushrooms, scientists have recently developed qualitative and quantitative analysis methods for their distribution in mushrooms [3]. In the present research, it was intended to analyse some nucleosides and nucleobases in edible mushroom species collected from Tekirdağ region by HPLC system. The analyzed mushroom species are Truffle (Tuber borchii), Truffle (Tuber aestivum), Black Trumpet (Craterellus fallax), Lamb Belly (Morchella esculenta), Porcini (Boletus edulis), Sığır Dili (Hydnum repandum), Chanterelle (Cantharellus cibarius) and Kanlıca (Lactarius salmonicolor) mushrooms, respectively. After the mushrooms were lyophilized, they were stored at -20°C. The nucleotides in the mushrooms were analyzed by the reverse phase liquid chromatography method. Separation of compounds was accomplished by gradient elution on a SWEA C18 column (4.6 mm x 250 mm, 5µm). A mixture of MeOH: 50 mM sodium phosphate buffer (1:99, v/v) at pH 3.7 as solvent A; MeOH: 50 mM sodium phosphate buffer (20:80) at pH 6.2 was used as solvent B. The internal standard is 3-methyl xanthine. The method has been validated. Two different extraction methods were used to extract the lyophilized mushroom samples, namely, sonication-assisted liquid extraction and pressurized liquid extraction. Deionized water was used as the extraction solvent. Parameters such as temperature and time have been optimized. The 14 nucleotides were simultaneously separated at a wavelength of 254 nm in 25 minutes. Sonication-assisted liquid extraction method has been found to be more effective. This is because the pressurized liquid extraction system is a closed system and matrix-solvent interaction is insufficient. Among the edible mushroom species studied, Lamb's Belly was found to have the highest nucleotide content. Adenosine, guanosine and uridine were found to be the most abundant compounds in all mushrooms studied.

KEYWORDS: HPLC-DAD, nucleobase, nucleoside, edible mushrooms, sound wave assisted liquid extraction.

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[PP10]

SIMULTANEOUS DETERMINATION OF PARACETAMOL AND CHLORZOXAZONE BY SECOND-ORDER DERIVATIVE SPECTROPHOTOMETRIC AND RP-HPLC-DAD METHODS

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Analysis of active ingredients in drugs is one of the critical issues in the pharmaceutical industry. Validated chromatographic methods are commonly used for drug analysis, but alternative methods are also being developed. The derivative spectrophotometric methods are popular for the analysis of pharmaceuticals. A second-order derivative UV-Visible spectrophotometric method was developed in this study for the simultaneous determination of paracetamol(PAR) and chlorzoxazone(CZN). PAR is one of the most popular painkillers used in the world [1]. CZN is an active ingredient with a muscle relaxant effect [2]. Drug formulations containing these two active ingredients help improve muscle pain and spasms. HPLC methods have often been used in the literature to determine PAR and CZN quantitatively [3-5]. In the developed spectrophotometric method, PAR and CZN calibration graphs were prepared at 278.5 and 290.3 nm wavelengths via zero crossing points of the second-order derivative spectra. The obtained coefficient of determination (R^2) was 1.00 for both ingredients. The limits of detection (LODs) were 0.24 mg/L and 0.20 mg/L, and the limits of quantification (LOQs) were 0.80 mg/L and 0.67 mg/L for PAR and CZN. The developed second-order derivative method shows good accuracies as the recoveries of 100.4% and 98.2% and high precisions as the RSDs% of 1.22 and 0.66 for PAR and CZN. The results of the proposed method were compared with the RP-HPLC-DAD method. A reverse-phase C18 column and the methanol mobile phase were used for the chromometric determination. Absorptions were measured at 260 nm, and calibration graphs were obtained with the 0.9999 and 0.9994 coefficient of determination (R^2) for PAR and CZN. The recovery percentages of PAR and CZN in the same mixtures used in the second-order derivative spectrophotometric method were 99.2% and 99.8%, with 3.11 and 1.50 RSDs%, respectively. According to the obtained results, it can be said that PAR and CZN active ingredients can be determined simultaneously by the proposed second-order derivative spectrophotometric method.

KEYWORDS: Paracetamol, chlorzoxazone, second-order derivative spectrophotometry, RP-HPLC

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[PP11]

SIMULTANEOUS BIOSORPTION OF ACID VIOLET AND REACTIVE YELLOW DYES ONTO DEAD BIOMASS

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Dye purification from process water is a crucial step in the textile industry. Many methods, such as ion exchange, photocatalytic degradation, membrane processes, electrocoagulation, oxidation process, and adsorption, can be used for the removal process [1]. Besides the advantages of the methods, they may have disadvantages, such as operational costs and chemical use. Biosorption, an adsorption method in which biological substances are used as adsorbents, is frequently preferred due to its eco-friendly properties. Mainly, dead biomasses were used for adsorption, and the removal process occurs via functional groups of cell membranes. In this study, the dead biomass of *Cladosporium cladosporioides*(CC) mold was used for the simultaneous removal of acid violet 90 (AV90) and reactive yellow 145 (RY145) textile dyes. AV90 and RY145 are classified as azo dyes and should be removed from effluents before discharge [2]. Dye adsorption experiments in the literature mainly involve single components [3, 4]. In binary mixtures, analysis of dyes by absorption-based single-point calibration becomes impossible due to overlapping absorption wavelengths. The easiest way to eliminate this problem is derivative spectrometry. The absorption overlap issue of AV90 and RY145 in this study was solved by developing a first-order derivative spectrophotometric method. The calibration graphs of AV90 and RY145 were prepared at 578.4 and 318.2 nm via zero crossing points of the first-order derivative spectra. The obtained coefficient of determination (R^2) was 0.9997 and 0.9998 for AV90 and RY145. The calculated recoveries for mixture solutions of AV90 and RY145 were 99.9% and 101.3%, and RSDs% were 1.48 and 1.50, respectively. Optimum dye removal for both dyes was obtained at pH 4, and 100% removal was achieved with 0.25 g of dead biomass within 60 minutes for both AV90 and RY145.

KEYWORDS: Acid violet, reactive yellow, first-order derivative spectrophotometry, biosorption.

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[PP12]

ASSESSMENT OF MONOCLONAL ANTIBODY N-GLYCAN CONFORMATIONS VIA A NOVEL TIMS-HPLC-HILIC-FLD APPROACH

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Monoclonal antibodies (mAbs) are highly significant biotechnological drugs for the treatment of diseases such as cancer, cardiovascular, and diabetes [1]. They are derived from cell cultures or specific organisms such as rabbits, rats, and mice, primarily possessing a protein structure. Given their susceptibility to enzymatic and chemical alterations during and after production, meticulous characterization is imperative before human use. mAbs typically undergo glycosylation, a prevalent post-translational modification crucial for their activation and structural property modifications [2]. Since mAbs have a complex structure, it is very important to obtain comprehensive information about their properties, including, sequence, composition, mass, and post-translational modifications (PTM's) [3]. The analysis of N-glycans, which significantly affect the efficacy of these drugs, is of vital importance. Conformational analysis of N-glycans within mAbs remains inadequately explored, with a lack of widely adopted analytical methods in this regard.

In this study, one of the new ion mobility mass spectrometry techniques, the trapped ion mobility mass spectrometry (TIMS) platform, was integrated with the gold standard analytical technique (liquid chromatography-hydrophilic interaction liquid chromatography-fluorescence detection, HPLC-HILIC-FLD), which is especially used for glycan analysis. This integration allows us to obtain information about the conformational dimensions of mAbs N-glycans. For the analysis of N-glycans, trastuzumab, bevacizumab, and human IgG N-glycans were labeled with procainamide, a unique compound facilitating their detection via fluorescence detection (FLD) and mass spectrometry. These labeled glycans underwent analysis using an HPLC-HILIC-FLD system with TIMS capability, yielding collision cross section (CCS) data for N-glycans from both monoclonal antibodies and immunoglobulin G. CCS values offer insights into the structural conformation of these glycans, with the presence of monosaccharide units like fucose, galactose, and sialic acid directly impacting their conformational properties.

The novel platform revealed variations in CCS values among N-glycans obtained from different commercially available monoclonal antibodies and immunoglobulin G. This platform holds promise for in-depth N-glycan structure elucidation and enhancing our understanding of N-glycan conformational changes in monoclonal antibodies during manufacturing and post-processing stages.

KEYWORDS: Monoclonal Antibodies (mAbs), Mass Spectrometry, Glycosylation, Trapped Ion Mobility-Mass Spectrometry, N-Glycan.

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[PP13]

AN ECO-FRIENDLY HPLC METHOD FOR THE DETERMINATION OF THEOPHYLLINE IN PHARMACEUTICAL FORMULATIONS

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1,3-dimethylxanthine ($C_7H_8N_4O_2$) known as theophylline is a drug active ingredient that expands the airways in the lungs, facilitates the entry and exit of air into the lungs and relieves breathing. It has been used in the treatment of asthma and chronic obstructive pulmonary disease since 1922 and continues to be one of the most preferred drugs in the treatment of respiratory diseases worldwide due to its cheapness. Although theophylline is a powerful and useful bronchial relaxant (bronchodilator), it is very crucial to investigate the reliability of theophylline concentrations for its pharmacological effect because it has a narrow therapeutic range (5-20 μg/mL) [1,2].

In recent years, the leading analytical method used in the analysis of active pharmaceutical ingredients is High Performance Liquid Chromatography (HPLC), which is derived from classical column chromatography. HPLC is an advanced form of liquid chromatography used to separate the complex mixture of molecules encountered in chemical and biological systems in order to better recognize the role of individual molecules [3,4].

In this study, we propose a new economical and environmentally friendly HPLC method as an alternative to existing methods for the quantitative analysis of theophylline. In existing methods in the literature, chemicals such as acetonitrile and methanol are frequently used for theophylline analysis. In our study, the most ideal conditions suitable for green chromatographic methods are provided by using a mobile phase consisting of water and ethanol, which allows direct analysis without requiring any preliminary preparation. For this purpose, the method was optimized using the Box-Behnken experimental design model in terms of pH, flow rate and ethanol ratio of mobile phase. The developed method was applied to a drug sample sold in the form of controlled release capsules in the market and successful results were obtained. In this regard, it is recommended as a promising, rapid and simple method for the routine analysis of theophylline in the pharmaceutical industry.

KEYWORDS: Theophylline, green HPLC, Box-Behnken experimental design, controlled release capsule.

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[PP14]

INVESTIGATION OF THE CHEMICAL PROFILE OF EVERLASTING FLOWERS BY GC-MS AFTER SOLID PHASE MICROEXTRACTION

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Phytochemicals, known as bioactive compounds in plants, are not only known to be produced by plants for self-protection but have also been proven to protect the human health against diseases [1]. In addition to the traditional use of plants in the treatment of colds, flu, bloating, indigestion, wounds and burns, fatigue, allergies, research on phytochemical and pharmacological studies also reveals the potential of plants for drug discovery/design. *Helichrysum* species (*Asteraceae*), popularly known as everlasting flowers, are aromatic plants of the Mediterranean region and are known for their secondary metabolite content [2]. Although *Helichrysum arenarium* is known for its potential in the treatment of gallbladder disease and is classified as an endangered species in some European countries, data on its analysis are rare in the literature [3]. The extraction of *H. arenarium* is an important step in obtaining health-effective active substances. In order to overcome the disadvantages of traditional processes such as low extraction yield, long extraction time, high cost, to preserve the integrity of the compounds and to provide an environmentally friendly process, interest in solid phase micro extraction (SPME) applications has increased. In this study, the flower and leaf parts of the everlasting flowers from Muğla region were obtained and taxonomically identified. The extraction of volatiles was performed using two different SPME fibers coated with polydimethylsiloxane-divinylbenzene (PDMS/DVB) and carboxene-polydimethylsiloxane (CAR/PDMS). For each extraction, 300 mg of sample was placed in a 20 mL vial sealed with a polytetrafluoroethylene (PTFE) coated silicone septum and exposed to head-space. SPME fibers were quickly inserted into the injection port and desorption of analytes was achieved. The chemical profile was determined by GC-MS with an electron ionization (EI) quadrupole mass analyzer under appropriate experimental conditions. The identification of volatile organic compounds was based on comparison of their mass spectra with NIST27, NIST147, WILEY7 library data. The effects of SPME fibers of different polarity on the composition of different compounds were investigated and extraction efficiency was compared. The use of everlasting flowers in the form of infusion for the treatment of digestive disorders has been officially approved by WHO and EMA [4].

KEYWORDS: Solid phase microextraction, phytochemical, Helichrysum arenarium, chemical profile.

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[PP15]

DETERMINATION OF THE ESSENTIAL AMINO ACIDS VALINE, ISOLEUCINE AND TRYPTOPHAN BY HPLC AFTER DERIVATIZATION

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Proteins are complex macromolecules that make up about 50% of the dry weight of a living cell. The biological importance of proteins varies in terms of the types of amino acids (exogenous/endeogenous) they contain. Exogenous amino acids (isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, valine) are not synthesized in the body and must be taken with food, while endogenous amino acids can be synthesized in the body. The biological value of a protein is determined by the balance of exogenous amino acids it contains [1]. In the European Pharmacopoeia, amino acids are traditionally separated by thin layer chromatography and then sprayed with ninhydrin and determined by the color of the resulting compound [2]. The sensitivity of the method is low and its use for quality control is limited. In the literature, amino acids are extracted before analysis or are usually determined by chromatographic methods using pre-column or post-column derivatization after passing through an ion exchange column since they can form ionic compounds depending on pH. In this study, derivatization was performed with 2-methoxy benzaldehyde [3] without any pretreatment; 2-methoxy-N-benzylidene-L-tryptophan methylester, 2-methoxy-N-benzylidene-L-isoleucine methylester and 2-methoxy-N-benzylidene-L-valine t-butylester amino acid-Schiff bases were synthesized. The derivative compounds obtained could be determined simply and rapidly by HPLC. Different amino acid:aldehyde ratios were investigated. Since the aim of the study was not only to analyze the three amino acids separately, but also to determine the experimental conditions under which they could be successfully separated from each other when the three amino acids were present together, gradient elution was employed. The retention times were 6.66 min. for 2-methoxy-N-benzylidene-L-tryptophan methylester, 10.42 min. for 2-methoxy-N-benzylidene-L-isoleucine methylester and 12.43 min. for 2-methoxy-N-benzylidene-L-valine t-butylester. Chromatograms of serial amino acid-Schiff base solutions with concentrations ranging from 1.0×10^{-5} to 5.0×10^{-3} mol/L were recorded. The peak areas of each solutions are plotted against the concentrations and calibration graphs were obtained. The limit of detection (LOD) and limit of quantification (LOQ) for 2-methoxy-N-benzylidene-L-tryptophan methylester, 2-methoxy-N-benzylidene-L-isoleucine methylester and 2-methoxy-N-benzylidene-t-butylester were calculated as 6.16×10^{-5}–2.05×10^{-4}, 5.94×10^{-5}–1.98×10^{-4} and 1.41×10^{-4}–4.71×10^{-4} mol/L, respectively.

KEYWORDS: Amino acid, Schiff base, derivatization, HPLC.

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[PP16]

DEVELOPMENT AND VALIDATION OF A QUANTITATIVE/CONFIRMATORY METHOD FOR THE DETERMINATION OF EPRINOMECTIN DRUG RESIDUES IN FISH BY LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY

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Veterinary drugs are applied to food-producing animals to prevent or treat diseases. They improve growth and feed efficiency. Common, incorrect, or illegal usage of veterinary drugs causes drug residues to accumulate in animal products such as milk, eggs, meat, fish, and honey. These residues may lead to potentially toxic, carcinogenic, or teratogenic public health risks [1,2]. To ensure that veterinary drugs are administered within legal limits and in the correct dosage, lists of prohibited substances in food products and maximum residue limits (MRL) for permitted drugs have been reported by the European Commission EMA/CVMP [3]. Veterinary drug residues are detected in animal products with validated methods in different biological samples and limits depending on the animal species. This study aimed to develop and validate a method for the determination of eprinomectin, an antihelminthic veterinary drug in fish. Eprinomectin was extracted by liquid-liquid extraction with acetonitrile. Eprinomectin's quantitative and confirmative determination was performed by ultra-high performance liquid chromatography-tandem mass spectrometry in positive ion mode. Validation of the method was carried out taking into account the criteria and recommendations of European Commission Decision 2002/657/EC and the implementation of Council Directive 96/23/EC [4]. In-house method validation of fish tissue was performed at five levels. Moxidectin was selected as an internal standard. Method linearity was assayed by performing calibration curves using fish samples spiked (matrix-matched calibration) with the analyte in the range of five points (Blank, 25, 50, 75, and 100 μg kg^{-1}). Calibration curves were obtained by least squares linear regression analysis of peak area versus concentration and the response was linear over the range tested ($r^2 \geq 0.99$). Validation was reported by specificity, linearity, and recovery data. Intra-day and inter-day precision were found to be 0.6% and 1.1%, respectively, and recovery was found to be 100.8%. CCα (51.2) and CCβ (52.4), eprinomectin with an MRL of 50 μg kg-1 were calculated.

KEYWORDS: Eprinomektin, fish, veterinary drug residue, UHPLC-MS/MS

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[PP17]

QUANTIFICATION OF ELLAGIC ACID AND RUTIN IN SAMBUCOL AND SAMBUCUS BLACK ELDERBERRY SUPPLEMENTS AND CERTAIN FOODS BY HPLC USING A PHENYL COLUMN

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Elderberry (Sambucus nigra) is a berry fruit found in several countries worldwide, which is one of the oldest and the important medicinal plants used particularly for the purposes of pharmaceutical and food. [1]. Numerous studies have shown the medicinal benefits of this plant due to the attendance of substantial numbers of polyphenolic compounds, used in many therapies and medical applications [2]. It is well-established that these compounds play a significant role in the production of a variety of medications known for their antioxidant, anti-inflammatory, and antipyretic properties. This plant contains known subgroups such as phenolic acids and flavonoids, especially, ellagic acid and rutin [3, 4, 5]. In this study, high performance liquid chromatography (HPLC) method was developed and validated for determination of ellagic acid (EA) and rutin (RUT) in sambucol and sambucus black elderberry supplements, and certain foods including cranberry molasses and pomegranate juice. EA and RUT were separated on a phenyl column (4.6 mm×100 mm×3 µm) using a photodiode array detector (DAD) at 254 nm. Gradient elution was performed with mobile phases of A (water:methanol:formic acid; 88:10:2; v/v) and B (water:methanol:formic acid; 8:90:2; v/v). The flow rate and injection volume were set as 1.0 mL/min and 20 µL, respectively. Ethylparaben was used as an internal standard (IS). Matrix-matched calibration curve method was applied in the experiments. Linear curves were obtained with high correlation coefficients (r2= 0.9916-0.9985) for EA and RUT. The results of intra-day and inter-day precision indicated that RSD% values were less than 5.90%. Recovery values were found within the range of 90–103%. The detection and quantification limits were 0.0000104 µg/L and 0.0000314 µg/L for EA; 0.0000427 µg/L and 0.0001290 µg/L for RUT.

KEYWORDS: Ellagic acid, Rutin, Black elderberry, HPLC, Phenyl column, Validation.

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[PP18]

DETERMINATION OF LISINOPRIL DIHYDRATE BY USING DIFFERENT ANALYTICAL METHODS.

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Lisinopril dihydrate is one of the drugs in the group of angiotensin converting enzyme (ACE) inhibitors which is one of the most important chemical agents used in the treatment of hypertension [1]. It is active not only in the treatment of hypertension, but also in the treatment of congestive heart failure, relaxation of blood vessels, lowering blood pressure, improving survival after a heart attack, and diabetes [2]. For the drug development and for treatment purpose it is very important to be able to quantify the drug and its metabolites in a wide variety of sample (serum, plasma, urine and pharmaceutical products) to establish its pharmacokinetic, metabolic pathway, dosage, etc. This implies the need for analytical methods with high sample-throughput, low limits of detection and low maintenance costs [3]. Several methods have been reported for the determination of Lisinopril (LIS) including high performance liquid chromatography with ultraviolet detection (HPLC/UV), liquid chromatography with mass spectrometry (LC/MS), spectrophotometry, spectroflumeorimetry and chemiluminescence [4,5]. Few analytical methods for determination of Lisinopril Dihydrate have been reported, however no enough literature data for drug impurities and its stability studies [6]. The aim of this study is to develop a cheap, simple and sensitive methods for analysis of Lisinopril Dihydrate in pharmaceutical dosage forms in Turkey. In the study, new analytical methods will be developed using the HPLC-DAD system and HPLC-ELSD system. The results will be evaluated statistically within methods and validations will be applied.

KEYWORDS: Lisinopril Dihydrate, Analytical Methods, High Performance Liquid Chromatography, pharmaceutical dosage form.

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[PP19]

A NEW VALIDATED AND STABILITY INDICATING ASSAY METHOD BY HPLC FOR COMBINED HYPERTENSION DRUG PRODUCT: VALSARTAN AND CHLORTHALIDON

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High blood pressure, also known as hypertension, is a severe medical ailment that greatly enhances the likelihood of heart, cerebral, renal, and various other health issues.[1] When chlorthalidone is combined to valsartan, it has a beneficial effect on blood pressure.[2] The developed method for assessing the stability of Chlorthalidone in combination with Valsartan is both uncomplicated and rapid. Precision analysis results with a relative standard deviation are less than 2%. These results are improved that the method is both reproducible and accurate. The accuracy range is between 98.0% and 102.0%. Recovery of the method is ensures good precision. In addition to this specificity test is demonstrated that there is no interference between active ingredients (API) and placebo, mobile phase and diluent. Therefore the method is highly specific for Chlorthalidone and Valsartan.

Stress degradation studies were conducted under acidic, basic (alkaline), oxidative, and thermal conditions. The method was successfully specific for API's in the presence of degradants. The active ingredients exhibited degradation under oxidative, acidic, basic conditions. The active ingredients are stabile under thermal degradation conditions. In conclusion, this method is reliable for the analysis of Chlorthalidone in combination with Valsartan in tablet pharmaceutical form, even in the presence of degradants.

In summary, in this study, a HPLC method has high efficiency, reproducibility and reliability for Chlorthalidone and Valsartan. The developed method can be preferred in the pharmaceutical industry for its ease of use in the assay analysis of pharmaceutical preparations containing Chlorthalidone and Valsartan active ingredient.

KEYWORDS: Valsartan, chlorthalidone, assay method, RP-HPLC

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[PP20]

SIMULTANEOUS DETERMINATION OF PHENOLIC COMPOUNDS IN *Ulva rigida* C.Agardh BY SPE AND HPLC

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Algae contribute to biodiversity in aquatic ecosystem with approximately 44,000 identified species. Macroalgae, also known as seaweeds, are aquatic, macroscopic prokaryotic or eukaryotic organisms. They are generally divided into three categories according to pigmentation: green (Chlorophyceae), red (Rhodophyceae) and brown macroalgae (Phaeophyceae) [1]. The green macroalgae *Ulva* Linnaeus, a genus belonging to the family Ulvaceae, has 130 taxonomically recognized species [2]. The most common species found on the coasts are *U. lactuca* L., *U. rigida* C.Agardh, *U. intestinalis* L., *U. fasciata* S.F.Gray. *Ulva* species have been extensively studied because of the chemical compounds they contain which are useful for food, fertilizer and pharmaceutical industries. Studies have identified the presence of secondary metabolites from different groups such as, phenolics [3], terpenoids [4], carotenoids [5], fatty acids [6] and steroids [7]. Due to these bioactive molecules, *Ulva* species possess antioxidant, antimicrobial, antiviral, anticancer, anti-aging and some properties [8]. In this study, a solid phase extraction (SPE) and high performance liquid chromatography (HPLC) method was developed and validated for the determination of some phenolic compounds (caffeic acid, ferulic acid and rutin) extracts prepared from *U. rigida*. The species was collected from the Marmara Sea in February 2022. The macroalgea material was dried and grounded. The extracts were prepared by maceration with methanol following n-hexane-defatting. A hydrophilic-lipophilic balance cartridge was used in SPE procedure. HPLC method was found to be linear in the ranges 0.10-1.0 μg/mL for caffeic acid and ferulic acid and 0.25-2.5 μg/mL for rutin. Precision and accuracy studies were performed at concentration levels of 0.10, 0.50 and 1.0 μg/mL for caffeic acid and ferulic acid, and 0.25, 0.75 and 2.5 μg/mL for rutin. RSD% values were ≤2.5%. Accuracy was calculated as RME% (-3.4-2.3%).

KEYWORDS: HPLC, method validation, phenolic compounds, solid phase extraction, *Ulva rigida*

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[PP21]

ANALYTICAL METHOD VALIDATION FROM RP-HPLC TO RP-UPLC FOR IRBESARTAN, AMLODIPINE AND HYDROCHLOROTHIAZIDE IN PHARMACEUTICAL DOSAGES FORM

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High blood pressure or hypertension is a significant risk factor worldwide. The population with hypertension doubled between 1990 and 2019, reaching 1.3 billion. A study investigating eighty-seven different risk factors revealed that high blood pressure can cause a high rate of premature death and could prevent 10.8 million deaths. This disease causes more deaths than other risk factors (such as tobacco use and high blood sugar) [1]. Sources about this disease show that; It may work effectively with an angiotensin converting enzyme inhibitor (ACEI) or ARBs as an alternative to angiotensin receptor blocker (ARB) with calcium channel blocker (CCB) [2]. Therefore, in this study the combination containing irbesartan for ACEI, amlodipine for CCB, and hydrochlorothiazide for ARB was used. The goal is to advance a shorter method that demonstrates the confirmed stability of the combination of Irbesartan, Amlodipine and Hydrochlorothiazide with various parameters. Studies have suggested and confirmed that the UPLC method comparing Irbesartan, Amlodipine and Hydrochlorothiazide is faster than the HPLC method. The proposed UPLC method determines the quantification of Irbesartan, Amlodipine and Hydrochlorothiazide in pharmaceutical formulations that can be easily applied in quality control units. Both methods were compared by statistical analysis. The results show that; there was no significant difference observed at the 95% level in the recommended methods.

KEYWORDS: Amlodipine, HPLC, hydrochlorothiazide, irbesartan, UPLC.

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[PP22]

SURFACE CHARACTERIZATION OF AGAR BY INVERSE GAS CHROMATOGRAPHY

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The inverse gas chromatography (IGC) method is widely used by researchers as an easy-to-use, high-efficiency, low-cost for the physicochemical characterization of different materials such as polymers, composites, liquid crystals, nanomaterials, etc [1,2]. IGC is an inversion of conventional gas chromatography (GC). Contrary to GC, the investigated solid is the material acting as the stationary phase in the IGC column. Biopolymers have many applications in industries such as health, food, and cosmetics, thanks to their biocompatibility, low cost, abundance in nature, and sustainable properties [3]. Therefore, surface properties of biopolymers are very important for the industrial use of these materials. Amongst biopolymers, agar is very often used when developing cosmetic products because of its non-oily, suspending, emulsifying, stabilizing, and gelling properties. In addition, it does not show toxic and irritating properties [4]. In this study, the IGC method was used to investigate the surface properties of agar. The IGC studies were carried out in the temperature range from 303.2 to 323.2 K. From the net retention times in these temperature ranges, the dispersive surface energy and the acidic-basic character of the agar surface were calculated with polar and non-polar probes. Besides, the specific adsorption free energy and the specific adsorption enthalpy corresponding to acid-base surface interactions were determined. By correlating with the donor and acceptor numbers of the probes, the acidic and the basic surface properties of the agar were calculated.

KEYWORDS: Inverse gas chromatography, biopolymer, agar, surface properties.

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[PP23]

CONCURRENT DETERMINATION OF NIACINAMIDE, DEXPANTHENOL, PHENOXYETHANOL AND SODIUM BENZOATE IN SERUM SAMPLE BY HPLC-DAD

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Cosmetics, classified as facial and hair care, nail care, skin care, and antiperspirants, have provided a wide range of uses for personal care and health since ancient times [1]. Niacinamide or nicotinamide, one of the ingredients of some multi-vitamin and cosmetic preparations, is the active amide form of vitamin B3 and is named as pyridine-3-carboxamide by the IUPAC [2]. Another active ingredient of the cosmetic preparations, dexpanthenol, is an alcoholic analogue of pantothenic acid (vitamin B5). These active ingredients are known to be useful/effective in the treatment of various skin wounds and dermatitis, acne, skin itching and aging, and are used in cosmetic formulations [3]. Phenoxyethanol and sodium benzoate are added as preservatives to perishable products to extend shelf life or maintain quality [4]. On the other hand, excessive exposure of preservatives may pose a risk to human health, and the maximum allowable concentrations of cosmetic preservatives that pose this risk are evaluated by the EU expert committee. Therefore, it is important to develop analytical methods with high accuracy and sensitivity to identify and quantify these compounds in cosmetics in order to minimize risks to the environment and human health and to ensure consumer safety. The aim of this study is to develop a fast, accurate and sensitive analytical method using high performance liquid chromatography (HPLC) equipped with Diode Array Detector (DAD) for the quantitative analysis of four compounds, namely dexpanthenol, niacinamide, sodium benzoate, and phenoxyethanol. Chromatographic separations were performed on a C18 column (4.6mm x 250 mm x 5 µm particle size) along with phosphate buffer ($H_2PO_4^-/HPO_4^{2-}$) and acetonitrile mixture as a mobile phase. Variables such as different column, mobile phase type and ratio, pH, flow rate and detection wavelength have been investigated to obtain the best resolution of the analytes in a short time. The flow rate, pH and ratio of the mobile phase affecting the separation were optimized by experimental design. The developed method has been successfully applied to serum samples for the determination of the relevant substances in their routine analysis.

KEYWORDS: Dexpanthenol, niacinamide, sodium benzoate, phenoxyethanol

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[PP24]

DETERMINATION of CHEMICAL PROFILE CONTENTS by HPLC-DAD and GC-MS of *Eucalyptus citriodora* EXTRACTS with DIFFERENT TECHNIQUES and VARIOUS SOLVENTS and EXAMINATION of THEIR *In vitro* BIOLOGICAL ACTIVITIES

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Since eucalyptus species have many medicinal activities, the expectation of finding new natural antioxidants, anticholinesterase, tyrosinase inhibitors, urease inhibitors, α-amylase and α-glucosidase inhibitors from *E. citriodora* species is increasing. The increase in skin diseases, Alzheimer's disease, duodenal ulcer disorders and diabetes in our country and in the world increases such research. The fact that the bioactivities of the species planned to be studied have not been investigated and that such diseases are increasing day by day, led us to conduct this study.

Ethanol, diethyl ether and water extracts of *Eucalyptus citriodora* Hook leaves were obtained by maceration, decoction, infusion and ultrasonic extraction techniques. The phenolic content of the extracts will be determined by HPLC-DAD. In the final stage of the study, antioxidant activities of the extracts were evaluated using in vitro DPPH radical scavenging, ABTS cation scavenging, β-carotene linoleic acid and CUPRAC activity methods; Anticholinesterase inhibition activity, which is associated with Alzheimer's disease, was determined by the Ellman method against acetylcholinesterase and butyrylcholinesterase enzymes; tyrosinase inhibition activity associated with melanin hyperpigmentation; Urease inhibition activity, which is related to ulcers caused by Helicobacter pylori, and α-amylase and α-glucosidase inhibition activities, which are diabetes tests, were determined spectroscopically.

KEYWORDS: *Eucalyptus citriodora*, biological activity, chemical content

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[PP25]

DETERMINATION of CHEMICAL CONTENTS by HPLC-DAD and GC-MS of *Centaurea cyanus* L. EXTRACTS and EXAMINATION of ANTIOXIDANT and TYROSINASE INHIBITION ACTIVITIES

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Medicinal uses of plants have been well documented for thousands of years. They have evolved and adapted over millions of years to withstand bacteria, insects, fungi, and weathering to produce unique, structurally diverse secondary metabolites. Its ethnopharmacological properties have been used as a primary drug source for early drug discovery. According to the World Health Organization (WHO), 80% of people still rely on plant-based traditional medicines for primary healthcare, and 80% of 122 plant-derived medicines were related to their original ethnopharmacological purpose. Knowledge of traditional medicine (complementary or alternative herbal products) stimulated further exploration of medicinal plants as potential medicines and led to the isolation of many natural products that have become well-known pharmaceuticals.

Traditional medical practices formed the basis of many of the first medicines, followed by subsequent clinical, pharmacological and chemical studies. Probably the most famous and well-known example to date is the synthesis of acetylsalicylic acid (aspirin), the anti-inflammatory agent obtained from salicin, the natural product isolated from the bark of the willow tree. Investigation of *Papaver somniferum* L. (opium poppy) has resulted in the isolation of many alkaloids, including morphine, a commercially important drug first reported in 1803. In the 1870s, crude morphine obtained from the *P. somniferum* plant was boiled in acetic anhydride to obtain diacetylmorphine (heroin) and was found to be easily converted into codeine (painkiller). Historically, it is documented that the Sumerians and Ancient Greeks used poppy extracts medicinally, while the Arabs described opium as addictive.

In this study, a total of 12 extracts were obtained by maceration, decoction, infusion and ultrasonic extraction techniques of ethanol, diethylether and pure water extracts of the flowers of *Centaurea cyanus* L., which is widely used in phytotherapeutic and aromatherapeutic studies and spread in the Bodrum region of Muğla. The chemical component profile of the extracts to be obtained was determined by GC-MS and HPLC-DAD. The antioxidant and tyrosinase inhibition activities of each of the obtained extracts were tested.

KEYWORDS: *Centaurea cyanus* L., chemical content, antioxidant, tyrosinase

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[PP26]

DETERMINATION OF THE INHIBITORY EFFECT OF *Helichrysum arenarium* L. ON OXIDATIVE DNA BASE DAMAGE BY GC-MS/MS

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Free radicals are extremely effective chemical products that occur during metabolism. Important free radicals in biological systems are radicals formed from oxygen and are called reactive oxygen species (ROS). High concentrations of free radicals formed in various ways cause oxidative damage to biomolecules such as DNA and protein. When DNA is damaged, structures such as lesions in the bases and sugars in its structure, single and double-strand breaks, abasic regions, and DNA-protein cross-linking occur. Damage to DNA can cause cell death, mutation, cancer or different diseases, so it is important to detect this damage. Today, different methods are used to detect oxidative base damage. One of these methods, GC-MS/MS, is used for the simultaneous and sensitive diagnosis of oxidative DNA base damage products. In addition to understanding and determining the mechanism of action of reactive oxygen species, it is also necessary to remove them from the body or minimize their effects. The balance between the production of free radicals and antioxidants is therefore critical [1]. Antioxidants are compounds that reduce or eliminate the harmful effects of free radicals on our bodies. They are divided into two: natural and synthetic. Natural antioxidants are mostly found in plants [2]. *Helichrysum arenarium* (*H. arenarium*) is a plant rich in phenolic compounds, including flavonoids, essential oils, fatty acids, polyphenols, vitamins, coumarins, catechins and proanthocyanidins. *H. arenarium*, which grows in many parts of the world, has many biological activities including antibacterial, antiviral, antifungal, anti-inflammatory, antiproliferative and antioxidant [3].

In this study, the effect of *H. arenarium* extract on the formation of oxidative DNA base damage products was examined. Ethanol was used as the solvent in ultrasonic assisted extraction of *H. arenarium*. The total phenolic content and antioxidant capacity of the extract was determined by spectrophotometric methods and the quantitative analysis of the phenolic compounds was carried out by HPLC-DAD. The oxidative stress environment for DNA was created using the Fenton reaction. Samples with and without different amounts of extract were injected into the GC-MS/MS after the necessary sample preparation procedures and oxidative DNA base damage products were analyzed simultaneously. It was determined that oxidative DNA base damage products were significantly reduced in samples containing the extract. Since the results showed promising benefits of the extract, further research on the plant may be conducted for the food and pharmaceutical industry.

KEYWORDS: Reactive oxygen species, *Helichrysum arenarium* L., GC-MS/MS, DNA damage.

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[PP27]

SYNTHESIS OF SOME ISOTOPICALLY LABELLED PESTICIDE COMPOUNDS AND THEIR ANALYTICAL APPLICATIONS

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Pesticides are compounds which are used to prevent or eliminate various damages arising from living organisms [1]. Less than 1.0% of the total amount of pesticides used for weeds reaches the targeted pests and a large amount of pesticides are lost by deposition, flow pattern and photodegradation outside the target. Therefore, it can lead to undesirable harmful effects on ecosystems and people [2]. Monuron (3-(4-chlorophenyl)-1,1-dimethylurea), which is a phenyl urea herbicide, is often used to stop the growth of weeds by inhibiting their photosynthesis [3]. In this study, monuron and its isotopically labelled material (monuron-d_6) were synthesized in our research laboratory. After the synthesis of monuron and monuron-d_6, the characterization of these compounds was performed using tandem mass spectrometry, Fourier transform infrared spectroscopy (FT-IR) and nuclear magnetic resonance (NMR) systems. Liquid chromatography – triple quadruple mass spectrometry (LC-MS/MS) system is going to be used for the determination of monuron in foodstuff samples. The variable parameters of LC-MS/MS system are going to be optimized to get high signal to noise (S/N) ratio. After the optimizations, system analytical performance studies are going to be carried out for the evaluation of limit of detection (LOD), limit of quantification (LOQ) and linear range. Quadruple isotope dilution (ID^4) is going to be employ with the help of synthesized isotopically labelled material to obtain high accuracy and precision.

KEYWORDS: Monuron, isotope dilution, liquid chromatography–triple quadrupole mass spectrometry (LC-MS/MS)

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[PP28]

A NEW AND FAST HPLC METHOD FOR THE DETERMINATION OF PHENOXYETHANOL IN CREAM FORMULATION

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Phenoxyethanol is used as an antimicrobial preservative in drug, food, vaccines and cosmetic products (1-3). In this study, simple, selective and fast high performance liquid chromatograpic method has been developed and validated for the analysis of phenoxyethanol used as anti-microbial agent in cream formulation. Chromatographic analysis of matters was carried out in C18 column (150 x 4,6 mm, 5 µm i.d.) by isocratic application of acetonitrile-water (50:50, v/v) mobile phase system at flow rate of 1.0 mL/min. The column temperature was 30°C and phenoxyethanol was detected at 270 nm with diode array dedector (DAD). The validation of the developed method was performed according to the International Conference on Harmonisation guidelines Q2 (R1). The calibration curve showed a linearity at 0.125-0.375 mg/mL range LOD and LOQ values were determined as 31.25 ng/mL and 125.0 ng/mL, respectively. Intra-day and inter-day relative standard deviation values were calculated to be less than 0.05%. The mean recovery was calculated as 101.07%. The validated method was applied successfully to the determination of phenoxyethanol in cream formulation. The developed method can be used safely routine determination of phenoxyethanol in pharmaceutical preparations and cosmetic products.

KEYWORDS: Phenoxyethanol, HPLC, DAD, cream formulation, validation

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[PP29]

AN ULTRAHIGH-PERFORMANCE LIQUID CHROMATOGRAPHY-FLUORESCENCE DETECTION (UHPLC-FLD) METHOD FOR SIMULTANEOUS DETERMINATION OF OCHRATOXIN A (OTA), CITRININ (CIT) AND ZEARALENONE (ZEA) IN CERTAIN CEREALS USING A CORE-SHELL BIPHENYL COLUMN

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Mycotoxins are toxic secondary metabolites produced by various types of fungi and have negative effects on humans, animals, and crops that result in illnesses and economic losses. Mycotoxins are generally present in cereals and cereal products, coffee, cheese, milk, dried fruits, fruit and vegetable juices, spices, herbs, grapes, wine, cocoa and nuts etc. [1, 2, 3]. Thus, considering mycotoxins' adverse effects to living organisms and also to economy; new, sensitive, fast, selective and reliable analytical methods are always needed to monitor their occurrence in foods. In this study, a fast and an efficient ultra-high performance liquid chromatography by fluorescence detector (UHPLC-FLD) method has been developed and validated for the determination of some important mycotoxins including ochratoxin A (OTA), citrinin (CIT) and zearalenone (ZEA) in certain cereal samples. OTA, CIT and ZEA were detected simultaneously on a core-shell biphenyl (2.1 mm×150 mm×2.6 µm particles) column using a mobile phase system of acetonitrile:water (45:55 v/v; pH: 2.2 phosphoric acid) by fluorescence detector at values of λex:330 nm, λem:500 nm for OTA and CIT, and λex:236 nm, λem:440 nm for ZEA. Ethyl coumarin-3-carboxylate was used as an internal standard. The intra- and inter-day precisions were less than 5.5% and the recovery percentage values were close to 100%, which indicated that the method was precise and accurate. The method showed good linearities over the studied concentration ranges (r2> 0.998). Limit of detection (LOD) and limit of quantification (LOQ) values were found as 0.24 µg/kg and 0.71 µg/kg for OTA, 0.64 µg/kg and 1.97 µg/kg for CIT, and 1.28 µg/kg and 3.90 µg/kg for ZEA, respectively. The performance criteria parameters were evaluated in compliance with Commission Regulation (EC) No. 519/2014 and RSD(r)%, recovery% values were found within acceptable limits for the mentioned concentration levels of OTA, CIT and ZEA. The developed UHPLC-FLD method has been successfully applied for the determination of OTA, CIT and ZEA in some cereal samples.

KEYWORDS: Mycotoxin, UHPLC-FLD, validation, cereal, biphenyl column.

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[PP30]

DETERMINATION AND QUANTIFICATION OF NITROSO ARYL-PIPERAZINE ON QUETIAPINE API WITH LC-MSMS APPLICATION

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N-nitrosamines are organic compounds with the general structure $R_2N–N=O$. They are carcinogenic impurities and facile in formation and are often formed by the reaction of secondary and tertiary amines, amides, carbamates, and urea derivatives with nitrites or nitrogenous groups [1]. Although its name has increased in recent years, the history of nitrosamines is more than 100 years old. Firstly, it was defined by Otto Witt in 1878 as ‘'any substituted ammonia which contains, at least one atom of hydrogen, the univalent nitrosyl group, –NO, in immediate connection with ammoniacal nitrogen'’ [2]. Conclusion of a study conducted by John Barnes and Peter Magee in 1956, it was observed that the nitroso-dimethylamine molecule, also known as NDMA, caused liver tumors in rats and nitrosamines attracted the attention of scientists [3]. Although it has been the subject of evaluation in many different sectors in recent years, its history in the pharmaceutical industry is quite new. Firstly in 2018, NDMA and NDEA were detected in the Valsartan API produced by Zeijiang Huahai Pharmaceutical (ZHP), a Chinese manufacturer. Then, nitrosamines were announced as a new class of impurities by the FDA and EMA [4]. A worldwide recall was made for products and APIs and all of them were collected. In the following years, because of the observation of nitrosamine formation in different molecules such as Ranitidine and Metformin, regulatory bodies such as FDA and EMA published a guide for the detection and control of nitrosamines. This study aimed to detect and quantify the impurity of Nitroso aryl-piperazine (NAP), a nitrosamine specific to the Quetiapine molecule. Nitroso aryl-piperazine molecule is formed as an amine group because of the interaction of any nitrate or nitrite source with the breakdown product of the quetiapine molecule. According to the nitrosamine guide published by EMA, the limit is determined as a maximum of 400 nanograms per day [4]. According to Acceptable Intake of Quetiapine, the limit of NAP for Quetiapine is determined as 0.5 ppm per day. In this study, limit of dilute sample and quantitation limit are determined as 10 ppb and 0.39 ppb of this analytical method. NAP impurity was detected and quantified with the analytical method developed and validated in-house using the LC-MSMS. As a result of the study, it was observed that both quetiapine APIs obtained from two different sources were below the limit and even below the quantitation limit determined in the analytical method.

KEYWORDS: Analytical Method Development, Carcinogenic Impurities, LC-MSMS, Nitrosamines, Nitroso Aryl-Piperazine, Pharmacy, Quetiapine.

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[PP31]

A NEW METHOD FOR THE THERAPEUTIC DRUG MONITORING OF CITALOPRAM AND ESCITALOPRAM IN PLASMA BY LC-MS/MS USING SALLME

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Serotonin reuptake inhibitors (SSRIs) are prescribed for many indications such as major depression, dysthymia, panic disorder, obsessive-compulsive disorder, eating disorders and premenstrual dysphoric disorder [1]. Citalopram is one of the commonly prescribed SSRIs for various indications such as depression and anxiety disorder [2]. Escitalopram was approved by the FDA in 2009 for the treatment of acute and maintenance depression in adolescents aged 12 to 17 years [3]. It selectively and potently inhibits the serotonin transporter and is structurally the S enantiomer of citalopram [4]. Therapeutic drug monitoring combines pharmaceutical, pharmacokinetic, and pharmacodynamics information and refers to the individualization of treatment by aiming to maintain drug concentrations in biological fluids within a specific therapeutic range [5]. In addition, it helps the clinician to achieve systemic drug concentrations relevant to therapeutic efficacy and to guide dosing to reduce the risk of concentration-dependent side effects [6]. We developed a new LC-MS/MS method for the therapeutic drug monitoring of citalopram and escitalopram. The method was validated according to the European Medicines Agency Bioanalytical method validation guidelines [7]. In the developed method, analytes and internal standard were extracted from plasma by salt-assisted liquid–liquid microextraction (SALLME) technique and after that injected into the LC-MS/MS system. The calibration curves were validated between 50–220 ng/mL for citalopram and 15-160 ng/mL for escitalopram, with correlation coefficients of more than 0.99. Furthermore, the developed method was applied to real patient plasma.

KEYWORDS: Citalopram, escitalopram, salt-assisted liquid-liquid microextraction, therapeutic drug monitoring.

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[PP32]

A SIMPLE, AND RELIABLE RP-HPLC METHOD FOR THE DETERMINATION OF PHENYRAMIDOL HYDROCHLORIDE AND DEGRADATION IMPURITIES IN TABLET DOSAGE FORM

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Phenyramidol Hydrochloride, sold under the trade name Cabral, is a 4-aminopyridine derivative non-narcotic muscle relaxant, used for treating muscle spasms [1]. It relieves acute muscle pain by inhibiting phenytoin metabolism and increasing the phenytoin concentration in blood circulation [2]. While various products are sold on the market worldwide, no data is available in the US Pharmacopoeia, or the European Pharmacopoeia related to Phenyramidol Hydrochloride [3]. In this study, a simple and reliable RP-HPLC method was developed for the stability-indicating analysis of Phenyramidol Hydrochloride tablet dosage form and its forced degradation impurities. Degradation studies were performed under strong acidic, strong basic, concentrated peroxide, thermal conditions, along with photostability. Degradation was observed under peroxide and thermal conditions. A good resolution was achieved for the chromatograms.

KEYWORDS: Phenyramidol HCl, RP-HPLC, muscle relaxant, forced degradation, phenytoin inhibitors.

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[PP33]

PRECONCENTRATION OF COBALT AND CADMIUM IONS WITH MAGNETIC SOLID PHASE EXTRACTION AND DETERMMINATION BY ICP-OES

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Natural resources are disappearing and environmental pollution is increasing due to the rise of industry. Heavy metals accumulating in the environment are included in the ecosystem and become a part of the food chain. This situation poses a danger to the health of both people and other living things in the ecosystem. Therefore, heavy metal determination and recovery of heavy metals have gained importance nowadays [1,2]. The study is the synthesis of the Fe_3O_4 nanoparticle modified with APTES and TX-114, respectively, as adsorbent, and then determining these nanoparticles by magnetic solid phase extraction technique, by enriching them with Co(II) and Cd(II) heavy metal cations. The synthesized magnetic nanoparticles were characterized by FESEM, EDX, FT-IR and TGA. After this stage, all analyses were performed using ICP-OES. In was used as a standard internal substance in all of the experiments. All chemicals used for the experiment were of analytical purity, therefore they were used directly. After the enrichment process, the optimum conditions for the recovery of Co^{2+} and Cd^{2+} cations were determined as pH value 7, adsorbent amount 10 mg and contact time 180 minutes. Also this study is compatible with both Langmuir and Freundlich isotherm models. In the adsorption kinetic studies of the method, the so-called-second order equation was found to be more compatible than the so-called -first order equation. The effect on the desorption of Co^{2+} and Cd^{2+} ions was investigated in acidic and basic environments. Maximum recovery was achieved for both cations at 1.5 M HCl concentration. However, no significant recovery was obtained for both cations in NaOH containing environments. In the common ion study, the effect of many cations and anions on the recovery at different concentrations were investigated and it was observed that Co^{2+} and Cd^{2+} cations were experimentally recovered above 95% in the presence of these ions at certain concentrations. In order of relative standard deviation values (RSD), limit of quantification (LOQ), limit of detection (LOD) and enrichment factor (EF) were calculated as for Co^{2+} 3.05%, 1.88 μg/L, 0.564 μg/L, 109.41; for Cd^{2+} 1.40%, 2.963 μg/L, 0.889 μg/L, 20.99.

KEYWORDS: ICP-OES, magnetic nanoparticle, magnetic solid phase extraction, heavy metal recovery.

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[PP34]

NOVEL ADSORBENT $MgAl_2O_4@MoSe_2$ FOR EFFICIENT SOLID PHASE MICROEXTRACTION OF BISMUTH IN PRECONCENTRATED COSMETICS, WATER, AND FOOD SAMPLES PRIOR TO ANALYSIS USING FLAME ATOMIC ABSORPTION SPECTROMETRY

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Unlike most other heavy metals, bismuth exhibits low toxicity, making it an environmentally friendly or "green metal." Bismuth and its alloys find extensive commercial usage in various fields, including the manufacturing of lubricating grease, chemicals, catalysts, shot bullets, and cosmetics [1,2]. In this work, nano adsorbent $MgAl_2O_4@MoSe_2$ was employed in micro solid phase extraction (µSPE) to extract Bismuth (Bi) from food and water samples. FT-IR, FE-SEM, XRD, and FE-SEM-EDX were utilized for the characterization of $MgAl_2O_4@MoSe_2$, examining its functional groups, surface morphology, surface area, elemental composition, and crystalline structure. Optimization of various parameters, including solution pH, adsorbent dose, sample volume, eluent concentration and volume, vortex time, and matrix effect, was performed to achieve the best recovery values. Under the optimized experimental conditions, the analytical parameters were determined, with the limit of detection (LOD) and limit of quantification (LOQ) for Bi being 0.012 and 0.04 µg L^{-1}, respectively. The pre-concentration factors (PF) and enhancement factors (EF) were found to be 7.50 and 7.69, respectively, while the relative standard deviation (RSD%) was 1.55. The proposed method was successfully applied to artificial urine and sweat, cosmetics, natural water and food samples for detecting Bi metal, along with an addition and recovery test. The results demonstrated greater accuracy and reliability of the method.

KEYWORDS: µ solid phase extraction, Bismuth, $MgAl_2O_4@MoSe_2$, water and food samples, trace metal preconcentration.

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[PP35]

A NEW NANOCOMPOSITE (ND@CuAl$_2$O$_4$@HKUST-1) FOR MICRO SOLID PHASE EXTRACTION OF LEAD AND CADMIUM IN FOOD AND LEGUME SAMPLES PRIOR TO THE DETERMINATION BY FLAME ATOMIC ABSORPTION SPECTROMETER

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Heavy metals, including cadmium and lead, are naturally occurring elements that have been widely dispersed in the environment through various human activities. Their high toxicity has raised concerns about their impact on human health and the environment, making them important metals of public health significance [1-3]. In this study, a new nanocomposite (ND@CuAl$_2$O$_4$@HKUST-1) was synthesized using sol gel-calcination and hydrothermal synthesis methods and characterized by XRF, FTIR, and FE-SEM techniques. Synthesized nano sorbent was used for micro-solid phase extraction (μ-SPE) of trace levels of lead Pb(II) and cadmium Cd(II) before FAAS determination. Analytical parameters such as pH, sample and eluent volumes, sorbent amounts, and eluent type were optimized. The effects of matrix components were also investigated. The developed method was applied to NCS ZC73032 celery and NCS ZC73033 green onion-certified reference materials for method validation. The method was applied to determine the levels of Pb(II) and Cd(II) in food and legume samples obtained from Kayseri, Türkiye.

KEYWORDS: Micro solid phase extraction, heavy metals, FAAS, nanocomposite.

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[PP36]

ACTIVATED GRAPHITE@NiO NANOFLOWER FOR SOLID-PHASE MICROEXTRACTION OF COPPER FROM ENVIRONMENTAL SAMPLES AND DETECTION BY HIGH-RESOLUTION CONTINUUM SOURCE FLAME ATOMIC ABSORPTION SPECTROMETRY (HR-CS-FAAS)

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It was developed by combining solid phase microextraction (SPME) and high-resolution continuum source flame atomic absorption spectrometry (HR-CS-FAAS) for the determination of trace levels of copper in environmental water and food samples. In order to efficiently and selectively extract copper from the matrix environment, activated graphite@NiO nanoflower adsorbent was synthesized quickly and simply by microwave assisted [1], it was successfully characterized by FT-IR, XRD, FE-SEM and SEM-EDX methods and used as the extraction phase of SPME. In the SPME method, a number of basic extraction parameters such as pH, adsorbent amount, vortex time, sample volume, matrix effect, eluent type and volume [2] were optimized. Copper could be extracted effectively and selectively with the activated graphite@ NiO nanoflower based SPME/HR-CS-FAAS method developed under optimum conditions (desorption solvent: 0.25 M HNO_3, vortex time, 30 seconds, amount of adsorbent: 4 mg, enrichment factor: 160 and sample pH value: 7.0). LOD (Limits of Detection) and LOQ (Limits of quantification) were determined as 4.23 µg L^{-1} and 14.1 µg L^{-1}, respectively. The validity of this developed method was applied to industrial wastewater, drinking water, natural water and food samples as addition-recovery, and then certified reference materials SPS-WW2, NCS ZC73032 and IC-INCT-OBTL-5 (Oriental Basma Tobacco Leafs) were successfully applied. The method applied for the analysis of copper was successful with high recovery in the range of 95-103%.

KEYWORDS: Nanoflowers based adsorbent, microwave assisted synthesis, copper, solid phase microextraction, water and food samples, HR-CS-FAAS.

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[PP38]

DEVELOPMENT OF AN ANALYTICAL METHOD FOR THE SIMULTANEOUS DETERMINATION OF INORGANIC AND ORGANIC ARSENIC SPECIES IN FOOD SAMPLES

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Arsenic (As) is a toxic element that is likely to be found in the environment due to industrialization and is classified as (Group I) due to its carcinogenic effect for humans. Arsenic (As) compounds can be classified as organic or inorganic, with inorganic arsenic (iAs) having significantly higher toxicity than organic arsenic. Arsenic can accumulate in foodstuffs exposed to arsenic-contaminated environments [1]. Given the human risk assessment of different types of arsenic through the consumption of seafood, which is one of the most consumed food samples by humans, it is very important to accurately identify and quantify the arsenic species in such foods. This study, for the determination of As (III), As (V), methylarsonic acid (MMA) and arsenobetaine (AsB), which are inorganic and organic forms of arsenic in various sea products, which are food samples. A method with low detection limits was developed using an HPLC/ICP-MS with high sensitivity and selectivity. Ultrasonic (UAD) and microwave assisted extraction methods (MAD) were used as pretreatment for the determination of total arsenic and its species before the food samples were sent to the HPLC/ICP-MS system. MeOH: Water (v/v 3:1) solvent was chosen for both extraction methods. For the determination of arsenic species, Hamilton PRP X-100 anion exchange column and a mixture of 50mM $NH_4(CO_3)_2$, 0.5 mM EDTA and 1.0% MeOH were used in HPLC/ICP-MS system. The system analytical performance values were calculated under the optimum conditions and the limit of detection/quantification values were found 0.05/0.16 ng/mL, 0.03/0.11 ng/mL, 0.03/0.10 ng/mL, 0.07/0.22 ng/mL for As (III), As (V), methylarsonic acid (MMA) and arsenobetaine (AsB), respectively. Relative standard deviation values were found 2.34%, 1.01%, 2.32%, and 7.61% for As(III), As(V), methylarsonic acid (MMA) and arsenobetaine (AsB), respectively.

KEYWORDS: HPLC/ICP-MS, Speciation, Arsenic.

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[PP39]

LIGANDLESS-SOLIDIFIED FLOATING ORGANIC DROP MICRO-EXTRACTION METHOD FOR THE PRECONCENTRATION OF TRACE AMOUNT OF LEAD AND DETERMINATION BY FLAME ATOMIC ABSORPTION SPECTROMETRY

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Determination of trace lead from environmental samples was carried out by solidified floating organic drop microextraction as a preconcentration method before analysis by flame atomic absorption spectrometry. By the proposed method, the determination of lead from environmental samples, even at trace levels, was possible with an ordinary flame atomic absorption spectrometer. The lead ion formed a hydrophobic complex with the help of the anionic surfactant sodium dodecyl benzene sulfonate (SDBS) and potassium iodide (KI), and this hydrophobic complex was extracted into the 1-dodecanol drop. Predominant parameters affecting analytical performance have been studied and optimized. The optimum pH value was found to be 3.5. The optimum sample volume, SDBS concentration, KI concentration, and extraction solvent volume were found to be 75 mL, 50 mM in dodecanol, 0.02 M and 75 µL, respectively. In addition, the optimum extraction time was determined as 30 min, the optimum extraction temperature was 45 °C, the optimum mixing speed was 650 rpm and the ideal extraction phase volume was 0.50 mL. Methanol has been shown to be quite effective when used as a diluent. Under optimum conditions, the enrichment factor was 73, the limit of detection (3s) and precision were 3.3 ng/mL and 1.03% (n = 9, 100 ng/mL) detected, respectively. The limit of quantification (10s) was 10 ng/mL and the linear working range was 15-100 ng/mL for the proposed method, respectively. The accuracy of the developed method was evaluated by certified reference material analysis. The optimized method was applied to the determination of Pb(II) from environmental samples.

KEYWORDS: microextraction, SFODME, heavy metal, lead, FAAS.

[PP40]

SYNCHRONOUS FLUORESCENCE SPECTROSCOPY METHOD BASED ON CHEMOMETRICS: QUANTIFICATION OF INEXPENSIVE EDIBLE OIL ADULTERANTS IN EXTRA VIRGIN OLIVE OILS HARVESTED IN MUT (MERSIN) REGION

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Detection and quantification of inexpensive edible oil adulterants in extra virgin olive oils (VOO) is of great significance to the olive oil (OO) sector. To resolve this problem, a lot of spectroscopic methods combined with chemometrics have been reported; however, the findings obtained are limited and not always correctly predicted as methods are developed to a specific set of olive cultivars, harvesting/growing seasons, oil extraction techniques and geographical regions [1]. To quantify the adulterant level, the synchronous fluorescence (SyF) spectroscopy data of extra VOOs from two different harvests in Mut (Mersin) region were analyzed by multivariate partial least-squares regression (PLSR) analysis. Four different extra VOO samples belonging to the 2019 and 2020 October harvests (*n=VOO–1 to 4*) were adulterated by mixing with three different pomace olive oil (PO) samples (*n=PO–1 to 3*) or refined olive oil (ROO) samples (*n=ROO–1 to 3*). The adulterated extra VOO samples (n=216) were prepared in the percentage ranges of 0%–50% (*n=216;* extra VOO *of 4 different brands×PO of 3 different brands or ROO of 3 different brands ×9 different percentages*). All samples were refrigerated until analysis and were homogenized by shaking before the SyF measurements. Fluorescence measurements were directly performed on a Cary Eclipse fluorescence spectrophotometer (Agilent Tech. Inc., US). The data were collected in the emission wavelength region of 200–800 nm with λ_{exc}=360 nm, and the excitation & emission monochromators were used synchronous with ten different wavelength intervals ($\Delta\lambda$) ($\Delta\lambda$=10 to 100 nm). The root mean square errors of calibration (RMSEC) value of extra VOO–PO blends and extra VOO–ROO blends were in the range 0.64%–4.21% and 1.36%–2.3%, respectively. Consequently, using only one chemometrics regression model, the lower limit of detection of adulteration during the cross-validation process was 0.64 and 1.36% w/w for PO and ROO adulterant concentrations, respectively. The SyF spectroscopy method combined with chemometrics is very advantageous in terms of speed and cost, and provides great convenience by eliminating the laborious sample pre-treatments and chemical usage.

KEYWORDS: Extra virgin olive oil, adulteration, fluorescence spectroscopy, chemometrics.

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[PP41]

CRYOGEN FREE 60 MHz ^{1}H–NMR SPECTROSCOPY AND CHEMOMETRICS FOR THE AUTHENTICATION OF COLD PRESSED BLACK CUMIN (*NIGELLA SATIVA L.*) SEED OIL

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Recently, the label authentication of cold pressed black cumin seed oils (BCSOs) is of great relevance from an oil industrial point of view. This study aims to gain insights into the prediction of the authentication of cold pressed BCSO samples and commercial refined edible oil samples from different brands. To pursue the research, spectroscopic approach based on low–field nuclear magnetic resonance (NMR) spectroscopy is used in combination with chemometrics include principle component analysis (PCA) and linear discriminant analysis (LDA). 34 samples of known origin were utilized to develop qualitative models: the cold pressed BCSO (*n=8; BCSO–1 to 8*), refined sunflower oil (SFO)(*n=5; SFO–1 to 5*), soybean oil (SBO)(*n=5; SBO–1 to 5*), hazelnut oil (HNO)(*n=6; HNO–1 to 6*), cottonseed oil (CSO)(*n=5; CSO–1 to 5*) and virgin olive oil (VOO)(*n=5; VOO–1 to 5*) were analyzed by a Spinsolve cryogen–free benchtop 60 MHz NMR spectrometer (Magritek GmbH, Aachen, Germany). The spectra were acquired in full and specific δ (ppm) ^{1}H NMR spectral regions, with the time of 10 min per oil sample dissolved in 200 μL of deuterated chloroform ($CDCl_3$–d_6). A total of 100% of tested cold pressed BCSO and other samples were correctly classified on the basis of their origin by LDA. Higher eigenvalues were also obtained in the full and specific δ (ppm) ^{1}H NMR spectral regions, and it is evident that PCA models provide well classifications of different types of edible oils, according to their origin. To conclude, this study has successfully assessed the potential of cryogen–free low–field ^{1}H NMR combined with chemometrics to classify and discriminate the origin of cold pressed BCSO and other edible oil samples.

KEYWORDS: Black Cumin (*Nigella Sativa L.*) seed oil, authentication, refined vegetable oil, benchtop NMR spectroscopy, chemometrics.

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[PP42]

AN INVESTIGATION ABOUT REMOVAL OF SOME HEAVY METALS FROM AQUEOUS SOLUTIONS USING ACTIVATED BENTONITE

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Pollution caused by some heavy metals such as Pb, Hg, Cu, Cd and Cr in water is due to rapid urbanization, industrialization and increasing chemical use in agriculture. This pollution is a major threat to human and environmental health. These heavy metals have a highly toxic effect even at low concentrations. Since they are not easily biodegradable, they persist in nature and deteriorate water and soil quality, increasing health and environmental problems [1, 2]. One of the effective methods in removing these harmful heavy metals and other chemicals from wastewater is adsorption. Many natural and synthetic adsorbents are used for this purpose. Clay minerals and their modified forms are very effective in removing metal ions from wastewater [3]. In this study, $Fe(NO_3)_3.9H_2O$ was used for modification of Ca-bentonite for removal of Cu(II), Cd(II), and Cr(III) ions from aqueous solutions. For this purpose, the effects of parameters such as adsorbent amount, mixing time, pH and concentration on heavy metal adsorption were investigated. Metal contents were determined by atomic absorption spectrophotometry (AAS). From the results obtained, it was understood that natural clays performed well in removing metal ions. And also compared to natural clays, modified clays showed a higher performance for removal and recovery of metal ions.

KEYWORDS: AAS, activated bentonite, Cu(II), Cd(II), Cr(III).

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[PP43]

SPECIATION OF GOLD NANOPARTICLES AND TOTAL GOLD IN ENVIRONMENTAL SAMPLES BY DISPERSIVE SOLID PHASE EXTRACTION ON A THIOL-FUNCTIONALIZED ZIRCONIUM(IV) METAL ORGANIC FRAMEWORK AND DETERMINATION WITH ATOMIC ABSORPTION SPECTROMETRY

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This work explores the utility of a thiol-functionalized Zr-metal organic framework (MOF-SH) for the extraction and speciation of noble metal nanoparticles from environmental water samples. Due to the presence of a free thiol terminal group, extraction of metal nanoparticles and their precursor metal ions is performed on the large surface area of the MOF [1], instead of its pores, thus significantly decreasing the extraction time. Both gold nanoparticles and gold ions, as model species, could be quantitatively extracted from aqueous samples using dispersive solid phase extraction and determined with atomic absorption spectrometry. AuNPs of variable sizes and coatings could be effectively extracted on the MOF-SH thus enabling the determination of the total concentration of AuNPs in the sample. Gold ions were also co-extracted on the thiol groups, therefore, the separation of AuNPs from gold ions was achieved with ultracentrifugation, prior to extraction, followed by the independent determination of each species with atomic absorption spectrometry. The method could effectively extract and discriminate gold nanoparticles and gold ions from freshwater samples with detection limits for AuNPs as low as 650 femto-mol/L, recoveries between 73-132% and precision ≤12%, which is comparable to other methods.

KEYWORDS: Metal organic frameworks, gold nanoparticles, dispersive solid phase extraction

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[PP44]

INVESTIGATION OF THE SYNTHESIS OF Al_2O_3 NANOPARTICLE WITH *Myrtus communis* LEAF EXTRACT AND THE ANTIBACTERIAL EFFECT OF DEOCREM OBTAINED FROM $McAl_2O_3NP$

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Recently, research has been conducted by cosmetic manufacturers to develop and introduce new products using nanotechnological particles and delivery systems for various purposes, such as achieving long-lasting effects, providing enhanced UV protection, increasing penetration into the deeper layers of the skin, specific targeting, reducing toxicity, biocompatibility, and controlled release [1]. Interest in developing new formulations focuses on using nanoparticles that exhibit stable stability and facilitate the delivery of active cosmetic compounds to the skin at lower concentrations with fewer toxic effects [2]. The green synthesis method, which does not involve harmful chemicals and is environmentally friendly, using natural plant species, holds significant importance in achieving these goals. Aluminum oxide nanoparticles, widely used in many fields, possess a large surface area, spherical morphology, and protective structure and can be synthesized using the green synthesis method [3].

In this study, myrtle (*Myrtus communis* L.) leaf water extract obtained using the maceration technique was used to synthesize Al_2O_3 nanoparticles ($McAl_2O_3$) through green synthesis. The obtained $McAl_2O_3$ nanoparticles were characterized using UV-*Vis* spectrophotometry, HR-TEM, and SEM-EDS. The aluminum oxide nanoparticles crystal structure, sizes, and other morphological characteristics elucidated were incorporated into a deodorant cream formulation. The antibacterial effect of the deodorant cream preparation containing $McAl_2O_3$ nanoparticles was evaluated using the Broth Microdilution assay. According to the results, the nanoparticles have potential activity.

KEYWORDS: Nanoparticle, *Myrtus communis L.*, deocrem, antibacterial activity.

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[PP45]

EXPLORATION OF THE BINDING OF BISCOUMARIN DERIVATIVES TO BOVINE HEMOGLOBIN BY MOLECULAR DOCKING AND SPECTROSCOPIC METHODS

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It is inevitable for drugs to interact with hemoglobin (Hb), a blood protein, while being absorbed into the body and transported to target tissues through the blood. In this interaction, drug molecules act as ligands and form a complex structure by binding to hemoglobin. Thanks to this complex structure, hemoglobin can act as a natural drug carrier system [1]. Examining the interactions of drug candidates with hemoglobin, one of the drug carrier systems in the blood, is important in terms of pharmacology and pharmacokinetics. Hemoglobin-drug bindings can be elucidated by spectroscopic methods due to the fluorescence properties of Hb.Coumarins and their derivatives are natural compounds belonging to the group of secondary metabolites found in plants, and they exhibit a wide range of pharmacological effects. They are members of a class of compounds called benzopyrones, which are formed chemically by fusing a benzene ring with an α-pyrone ring [2]. Biscoumarins are dimeric coumarin derivatives linked by a bridge such as methylene, ethylene etc. They have also been observed to have broad biochemical and pharmaceutical properties [3]. The biscoumarin derivatives B1 (6,6'-methylenebis(3-(3,4-dihydroxyphenyl)-2H-chromen-2-one) and B2 (6,6'-methylenebis(3-(3,4-diacetoxyphenyl)-2H-chromen-2-one), whose binding to hemoglobin we examined, were also previously evaluated for their inhibitory effects on the monoamine oxidase (MAO) enzyme activity by our group. It was determined that B1 was selective for MAO-A and B2 for MAO-B. In our study, the binding and transport of previously synthesized and characterized biscoumarin derivatives with MAO inhibitory activity to bovine hemoglobin (BHB) were investigated by *in silico* and *in vitro* methods. Firstly, *in silico* molecular docking calculations (ligand binding energies, ligand efficiency values, and interaction types with amino acid residues in the active site) of the ligands and hemoglobin were carried out. Then the binding of the compounds to hemoglobin was examined in vitro using multi-spectroscopic methods such as UV-vis absorbance, fluorescence, and synchronized fluorescence. As a result of the studies, changes in the absorbance of BHB, fluorescence intensity, and microenvironment of tyrosine and tryptophan residues, as well as quenching mechanisms, binding constants, and the number of binding sites, were determined.

KEYWORDS: hemoglobin, biscoumarin, drug carrier, multi-spectroscopic techniques, molecular docking

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[PP46]

DETERMINATION OF MERCURY(II) BY MAGNETIC SOLID PHASE EXTRACTION USING Fe_3O_4@PPy NANOPARTICLES WITH COLD VAPOR ATOMIC ABSORPTION SPECTROMETRY

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Mercury is a heavy metal with high toxicity and persistence in the environment and has occasionally caused public health disasters. According to WHO reports, most mercury exposures come from dental amalgams, contaminated fish and occupational sources. It is considered one of the ten most dangerous chemicals [1]. Ultra trace amounts of Hg(II) ions can cause destruction or permanent damage in humans directly or through bioaccumulation by showing toxicological and carcinogenic effects [2]. Therefore, the removal and determination of Hg(II) ions with high sensitivity is extremely important. Direct determination of ultra trace Hg(II) ions requires costly and complex procedures or various pretreatments. In this study, Hg(II) ions were enriched with polypyrrole-coated magnetite (Fe_3O_4@PPy) and determined in various environmental samples by flow injection cold vapor generation atomic absorption spectrometry (FI-CVAAS). The synthesized Fe_3O_4@PPy was characterized by attenuated total reflection infrared spectroscopy (ATR-IR), X-ray diffractometer (XRD) and scanning electron microscopy (SEM). Adsorption and desorption methods and times as well as various parameters such as pH, sample and eluent volume, eluent type and concentration were optimized. As a result, Hg(II) ions were adsorbed with 50 mg Fe_3O_4@PPy from 125 mL sample at pH 5 and desorbed with 3 mol/L 1mL HNO_3. Quantitative recovery (>95%) and enrichment of Hg(II) ions were achieved under these conditions.

The LOD and LOQ values of Hg(II) ions in the developed method were calculated as 0.028 µg/L and 0.093 µg/L, respectively. NRCC-DORM4 certified reference material was used for the accuracy of the method and the results were found as 1.25% relative error and 2.37% relative standard deviation. The enrichment factor of the method was 125 and the correlation coefficient of the calibration graph was 0.9992. Hg(II) ions were analyzed in 5 different water samples and 9 different fish samples with the developed method and the results were found within permissible limits of the World Health Organization and US Environmental Protection Agency and regulation [3].

KEYWORDS: magnetic solid phase extraction, heavy metal, mercury, cold vapor atomic absorption spectrometry, atomic absorption spectrometry, enrichment, pre-concentration

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[PP47]

UTILIZING ATR-FTIR SPECTROSCOPY COUPLED WITH PCA AND PLS-DA TO MONITOR ATHLETES' SALIVARY PROFILE

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The field of sports science is rapidly gaining interest as it aids athletes in enhancing their performance while minimizing potential health risks [1]. In addition, there is a growing interest within the scientific community in non-invasive methods for collecting biological fluids. Saliva composition is closely linked to physical activity and offers valuable insights into an athlete's physical condition [2]. In this research, 57 male athletes with varying levels of physical fitness participated. Their salivary profiles were examined using infrared spectroscopy (ATR-FTIR) and subjected to multivariate analyses such as Principal component analysis (PCA) and Partial least squares Discriminant Analysis (PLS-DA). Through unsupervised PCA, we successfully differentiated spectral salivary profiles before and after physical exercise, as well as between athletes at different levels of physical fitness (low vs. high). Furthermore, we employed supervised PLS-DA to construct a more stringent classification and prediction model. This technique yielded highly promising outcomes regarding the discrimination, achieving an accuracy of 93% in athletes' classification. To the best of our knowledge, this study represents the inaugural use of ATR-FTIR spectroscopy in conjunction with multivariate analysis for estimating the physical fitness levels of athletes.

KEYWORDS: ATR-FTIR spectroscopy, athletes' fitness level, multivariate analysis.

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[PP48]

IDENTIFICATION OF PHARMACEUTICAL INGREDIENTS IN RAMAN SPECTROSCOPY

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Raman spectroscopy is a widely used technique in chemical analysis and material characterization. Material identification analysis, especially in complex mixtures, is a strong aspect of Raman spectroscopy. This analysis is commonly used, particularly in the pharmaceutical industry, to identify the raw materials and components of drugs, control their purity, and ensure the quality of products. Raman spectroscopy is a valuable tool for identifying active ingredients in, for example, drug tablets or excipients used in pharmaceutical formulations. However, this technique can generate complex spectral data, so material identification analysis involves processing and interpreting the data. Material identification analysis using Raman spectroscopy has significant applications in various fields, including the pharmaceutical industry, and plays a crucial role in product quality, reliability, and compliance. Raman spectrum has begun to be widely used to answer questions from health institutions and authorities in different countries.

The fingerprint region Raman spectroscopy, typically between 0 to 2000 cm-1, is used to characterize molecules by utilizing their vibrational and rotational changes in this region. In this study, Renishaw RA802 pharmaceutical analyzer device was used. Analyses were conducted to identify active ingredients and excipients. This study aimed to conduct analyses for the identification of active and excipient ingredients within tablets. Tablet spectra is challenging for interpretation in recognition analyses due to their containing numerous excipients and active peaks. Because of this, tablet spectra have been subdivided by modelling.

Raman spectroscopy provides rapid identification of the phases of pharmaceuticals. The active ingredient and excipients, which components of oral dosage forms in different dosage, was compared with the active ingredient and excipients spectrums and they were seen that they overlapped with each other. The overlap of the spectra shows that the active ingredient and excipients in the analyzed test products are the same. The coincidences with the spectrum of the active ingredient and excipients show that identification is successful.

KEYWORDS: Raman spectroscopy, identification analyses, drug.

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[PP49]

ANALYSIS OF PHOTOOXIDATION OF COATING BY PHOTOACOUSTIC FOURIER TRANSFORM INFRARED SPECTROSCOPY

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Organic coatings are widely used in a large variety of application to improve the surface properties of all kinds of materials. However, they are damaged by the exposure environmental condition [1]. The service lifetime of coatings can be defined by a degradation in color, gloss and mechanical failure. In this study, the photooxidation of curing coating samples which have especially different binders, pigments, fillers and additives were investigated by accelerated weathering test to determine the chemical degradation of the binder structure by Photoacoustic- Fourier transform ınfrared spectroscopy (FTIR-PAS) [2]. The majority of the curing coating panels were exposed in a Xenon Arc weatherometer which followed the standard SAE J2527 accelerated weathering protocol. This setup was modified with 'S' type borosilicate inner and outer filters, providing a radiant exposure of 0.55 W/m2 [3]. Photochemical stability was determined by a comparison of the chemical state change of the coating surface before and after exposure to 5000 hr. The changes in the FTIR-PAS spectra were determined using the ratio of the integrated intensity of the O-H, N-H stretching region to that of the C-H stretching region [(-OH,-NH)/-CH] between 3700 and 2200 wavenumbers on time zero and 5000 hr exposed sample. The results suggest that the change in ratio [(-OH,-NH)/CH] can serve as an acceptable indicator of photooxidation value for evaluating the service lifetime of coatings.

KEYWORDS: Organic Coatings, Accelerated weathering, FTIR-PAS.

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[PP50]

DEVELOPMENT OF AN ID-ICP-MS METHOD FOR DETERMINATION OF Nd IN WASTE PRINTED CIRCUIT BOARD

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Accurate determination of elements being used in technological equipments, so called technology critical elements (TCEs) is of high importance in electrical and electronic break through analysis of waste electrical and electronic equipment (WEEEs) consumption and also for recycling purposes. The economic value of WEEEs such as PCB has been determined by the presence of critical elements for which reliable measurement methods are needed. PCBs may contain important TCEs up to several hundreds of mg/kg levels [1]. Neodymium is one of the TCEs present in PCB which is used in many electronic devices that we use in our daily life, such as computer hard discs, magnets in variety of appliances, cellular phones, speakers [2]. Methods employing isotopic measurements are commonly used in the measurement of elements in different samples in the fields of environment, food safety, geology and metallurgy, especially at trace levels. In many cases, it is possible to select one of the interference-free isotope of the element interested. ID-ICP-MS, where at least two stable isotope is needed is accepted as a primary method of measurement [3]. Even though elemental interferences are corrected mathematically, chemical separation of the interfering elements before the measurement provide improved repeatability of isotope ratio values. Isolation of Nd form the interfering elements, Ce and Sm and also other elements whose Ar dimers interferes before introduction to ICP-MS are expected to improve the measurements. Chemical separation of Nd from these elements is uniquely challenging due to their very similar chemical properties. In the study, an ID-ICP-MS method employing chemical separation was developed and validated for traceable measurement of Nd in waste PCB material. The material below 200 µm particle size, which is produced in a joint research project EMPIR 20IND01 MetroCycleEU received funding from EU under Horizon 2020, was dissolved in 6 ml of 65% (w/w) HNO_3 and 2 ml of 30% (w/w) HCl using microwave digestion system. The chemical separation was done by using a pressurized extraction system and using lanthanide specific resin (50-100 µm) placed in PP micro-column (≈3 mm i.d. and ≈8 cm in length). The elution process was optimized for the separation of Nd from the interfering elements. Sample blends were prepared by spiking the isotopic CRM (enriched Nd-145) before digestion into digestion vessels. The measurement uncertainty for the determination of Nd in waste PCB material was estimated according to GUM bottom-up approach, and all its components are quantified using commercial software.

KEYWORDS: Technology Critical Elements, Waste Electrical and Electronic Equipments, Waste Printed Circuit Board, Isotope Dilution ICP-MS, Neodymium, Recycling, Matrix Separation.

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[PP51]

REMOVAL AND ENRICHMENT OF PB FROM WATER SAMPLE WITH MICROPOROUS CARBON SPHERES, AND DETERMINED BY ATOMIC ABSORPTION SPECTROMETRY

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In recent years, a number of materials have been investigated as solid-state adsorbents for the adsorption and desorption of trace metals, for example: zeolites, silica, porous polymer materials, metal organic frameworks and carbon materials. One of the materials that may be most suitable for adsorption is carbon materials. These materials have high surface area, large pore volume, chemical stability, suitability for metals, low cost, and the possibility of modification with heteroatoms [1]. In this study, the removal and enrichment of lead from water was aimed by using microporous carbon sphere solid phase synthesized by Pełech et al. [2]. Microporous carbon sphere was used as solid phase in dispersive solid phase extraction in the study. In this context, solid phase amount, pH, eluent type and concentration, eluent volume, sample volume, and matrix effect parameters were optimized. In studies, it was found that over 90% lead was recovered when the amount of solid phase was 10 mg, pH: 8.0, eluent type and concentration: 0.1 M HNO_3, eluent volume: 1 mL.

KEYWORDS: Carbon Spheres, Removal, lead, Dispersive Solid Phase Extraction.

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[PP52]

SYNTHESIS, CHARACTERIZATION AND ANALYTICAL APPLICATIONS OF A NEW SCHIFF BASE ((1E,1'E)-N,N'-(4-NITRO-1,2-PHENYLENE)BIS(1-(5-METHYLTHIOPHEN-2-YL)METHANIMINE) FOR METAL DETERMINATION

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It is impossible to neglect the importance of metal ions and the variety of their uses in chemistry. Researchers are becoming more aware of both their beneficial and detrimental effects on a variety of vital biologic processes [1]. The purpose of several research has preserved the natural ecosystem and prevented hazardous pollution, hence; trace metal determination in several matrices is crucial [2]. Schiff bases firstly described in 1864 can form metal complexes. Its synthesis was accomplished by transferring electrons from the active ends which is used to form complexes with metal ions [3]. In this study, a new Schiff base was synthesized and then characterized by Fourier transform infrared spectroscopy (FT-IR). The synthesized complexation agent is going to be used to generate proper organic structure of metal analyte(s) for its/their extraction/preconcentration from aqueous solutions. It is planned to use a liquid phase microextraction (LPME) method for the extraction/preconcentration of analyte(s) prior to flame atomic absorption spectrometry (FAAS) measurement. In the method that will be developed, necessary optimizations are going to be performed to attain low detection limits. After the optimum conditions to be determined, limit of detection (LOD), limit of quantification (LOQ), dynamic range and relative standard deviation for the lowest concentration found in calibration plot are going to be determined using external calibration strategy. Finally, the applicability and accuracy of the developed method are going to be evaluated by spiking experiments in real samples.

KEYWORDS: Schiff base, liquid phase microextaction, metal determination, analytical application.

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[PP53]

A NEW SCHIFF BASE (N-(5-NITRO-2-(((Z)-THIOPHEN-2-YLMETHYLENE) AMINO)PHENYL1-(THOPHEN-2-YL)METHANIMINE) LIGAND FOR METAL DETERMINATION: SYNTHESIS, CHARACTERIZATION AND ANALYTICAL APPLICATIONS

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The determination of heavy metals in several matrices is important due to their toxicity for public health and environment [1]. For this reason, several analytical instrumentation methods such as spectroscopic and electroanalytical methods have been employed to qualify/quantify heavy metals at trace levels [2]. A complexation agent is required to generate suitable form of a metal in order to extract/preconcentrate from an aqueous solution to an organic solvent in the application of one of the liquid phase microextraction methods [3–5]. For this purpose, a new Schiff base complexation agent was synthesized according to a method found in literature [6]. In the first step of synthesis procedure, 0.50 mmol of o-Phenylenediamine (0.0756 g) was weighted into 100 mL of two neck flask and then 10 mL of ethanol was added to dissolve o-Phenylenediamine. After, 1.25 mmol (117 µL) of thiophene-2-carboxaldehyde was injected into the solution with the help of syringe and then 5.0 mL of ethanol was added into the reaction medium. The reaction was refluxed at 80 ºC for approximately 4 hours and then the completion of reaction was checked by thin layer chromatography (TLC, ethyl acetate:hexane (3:1) was used as mobile phase). The solvent found in reaction medium was evaporated using a rotary evaporator system and then crystallization process was performed dissolving in ethyl acetate in the dark condition. The synthesized complexation reagent is going to be used in the determination of metal in a matrix after applying a liquid phase microextraction (LPME) method followed by flame atomic absorption spectrometry (FAAS).

KEYWORDS: Analytical application, liquid phase microextraction, metal determination, Schiff base.

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[PP54]

ICP-MS ANALYSIS AND VALIDATION BY MICROWAVE DIGESTION SYSTEM FOR DETERMINATION OF HEAVY METALS IN ALLERGY AND CANCER DRUGS TAKEN ORALLY

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The drug, which is one of the most important products that cannot be replaced in the field of health, prevents all threats to human health when used in place and in dosage. Therefore, it has an important place in public health. Determination of the amounts and impurities of various elements used in drug production is an important parameter [1,2]. According to the ICH Q3D(R1) international compliance conference guide, methods by which limit concentrations can be determined for elemental impurities by applying inductively coupled plasma (ICP) analysis to drugs are specified. In this study, sample preparation step in the analysis of 23 elements in cancer and allergy drugs in tablet form was optimized by microwave digestion and method development and validation studies were carried out for these drugs with inductively coupled plasma-mass spectrometry (ICP-MS) [3,5]. When the results of the analysis were evaluated, it was seen that the data obtained were in accordance with the limit values specified in the ICH. Detection and quantification limits of the developed method, relative standard deviation values were determined, and recovery studies were carried out by adding standards at 4 different concentrations in order to determine the precision of the method. The correlation coefficients obtained for heavy metals in this study ranged from 0.9993 to 1.000, while the detection limit was found to be between 0.001 and 1.756 μg/L. Thus, the reliability and precision of the validation study developed has been determined and it has been shown that this method can be used in similar drug samples.

KEYWORDS: Drug, elemental impurity, inductively coupled plasma-mass spectrometry, microwave digestion, validation.

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[PP55]

SYNTHESIS OF SILVER NANOPARTICLES USING BARBERRY (*Berberis vulgaris*) ROOTS VIA GREEN SYNTHESIS METHOD AND *IN VITRO* EVALUATION OF ANTI-DIABETIC ACTIVITY

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Green synthesis of nanoparticles is an environmentally friendly and biocompatible technique that enables the production of eco-friendly products. Various biological sources are used to synthesize metallic nanoparticles as an environmentally friendly method. Additionally, nanoparticles obtained through the extraction of natural products have been reported to be stable, cost-effective, and exhibit broader biological activity due to the phytochemicals they contain. These phytochemicals enhance the bioavailability of the biomaterial and facilitate the binding of the synthesized nanoparticles to different biomolecules and bio-surfaces [1,2].

Berberis vulgaris, belonging to the Berberidaceae family, is a shrub species native to Central and Southern Europe, Northwestern Africa, and Western Asia [3,4]. It has a long history of traditional use in Eastern and Western herbal medicine [5]. *Berberis vulgaris* and other plants containing berberine [6] are used as medicinal products in nearly all traditional medical systems [7].

The phytochemical analysis of *Berberis vulgaris* root, stem, or bark extract has been reported to be rich in alkaloids such as berberin tetrandrine, and condocurine, which contribute to its anti-inflammatory and immunosuppressive activities [8].

In this study, silver nanoparticles were synthesized using a green synthesis method with barberry root water extract. The obtained silver nanoparticles were characterized using UV-*Vis* spectrophotometry, HR-TEM, and SEM-EDS devices. *In vitro,* anti-diabetic activity analysis was performed on the characterized NPs. Compared to the anti-diabetic activity results obtained from various parts of the barberry plant, including fruits and roots [9], silver nanoparticles obtained with *Berberis vulgaris* root showed higher anti-diabetic activity.

KEYWORDS:

Green synthesis, silver nanoparticle, anti-diabetic activity, *Berberis vulgaris*.

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[PP56]

AN ANALYTICAL METHOD FOR THE DETERMINATION OF COBALT IN WASTEWATER

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Today, industrialization has become widespread and the increase in the world population has gained great momentum. With the increase in consumption, many resources have decreased. This has paved the way for resources to become polluted and unusable. One of the most vital of these resources is water. Cobalt in wastewater, especially in textile wastewater, causes a lot of damage. Because cobalt is widely distributed in the environment, people can be exposed to it by breathing air, drinking water and eating cobalt-containing foods. Cobalt is not usually freely available in the environment, but uptake by plants and animals is higher when cobalt particles are not bound to soil or sediment particles. Deposition can occur in plants and animals. The total daily intake of cobalt is about 1 mg.

The aim of this study was to analyze trace levels of cobalt metal in wastewater from Diyarbakır organized industrial zone with a new method with high sensitivity and efficiency. For this purpose, solid phase microextraction method, which is both financially and time advantageous, was applied [1]. Copper flower nanoparticles were first synthesized in the study. Analyzes were performed in FAAS device. The performance of the device, LOD and LOQ values were found as 0.4588-1.5278 mg/L. After the optimum experimental conditions, the LOD and LOQ values were 0.1376-0.4582 mg/L, respectively. This was determined to be approximately 3 times preconcentration. The recovery studies were quite successful. The accuracy of the developed method and its applicability to real samples were checked.

KEYWORDS: Cobalt, Pre-concentration, Waste Water, FAAS.

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[PP57]

DETERMINATION OF COBALT CONTENT IN RICE BY USING MAGNETIC NANOPARTICLES

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Rice consists of carbohydrates with little protein and almost no fat. Since rice grain is consumed a lot, its analysis is also very important. Cobalt is used to treat anemia in pregnant women because it stimulates the production of red blood cells. The total daily intake of cobalt should not exceed 1 mg. This study was carried out to analyze the trace levels of cobalt metal in rice grain consumed as a foodstuff with a new method with high sensitivity and efficiency. For this, solid phase microextraction method, which is both economical and advantageous, was applied. Magnetic nanoparticles are a class of nanoparticles that can be manipulated using magnetic fields. In this study, using the co-precipitation method, the surfaces of the synthesized Fe_3O_4 nanoparticles were coated with oleic acid in two layers to obtain a water-based ferrofluid [1,2]. The experiments were performed with FAAS. The LOD and LOQ values of FAAS were found to be 0.3122-1.0429 mg/L. As a result of the optimum experimental conditions, the LOD and LOQ values were 0.0937-0.3120 mg/L, respectively. With this method, better results were obtained by successfully biasing.

KEYWORDS: Cobalt, FAAS, Magnetic Nanoparticuls,Rice, Pre-concentration.

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[PP58]

DEVELOPED DISPERSIVE SOLID PHASE MICROEXTRACTION BY USING NOVEL MATERIAL FOR THE DETERMINATION OF LEAD

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The laboratory utilizes a range of analytical techniques such as; FAAS[1], ICP [2, 3], GFAAS [4] for the determination of different toxic metals from real samples. To ensure good recovery of analytes under different conditions, it is deemed important to carefully select a sorbent with a porous structure and a large surface area. To achieve this goal, in the present work, a hydrothermal procedure was utilized to modify nano-diamond with bismuth molybdate nanocomposites, which were subsequently characterized using various techniques like FTIR, FESEM, XRD, and EDX. Dispersive solid phase microextraction was employed for separation and preconcentration, with the efficiency of the method being influenced by different performance parameters. The limit of detection (LOD), limit of quantification (LOQ), and preconcentration factor (PF) values were determined for the procedure. For validation, certificated reference materials were used and satisfactory recovery results were obtained. The newly developed procedure was successful in determining lead in food and water samples using the flame atomic absorption spectrometric detection technique. The authors of this study gratefully acknowledge the financial support from Project No. 121C104, sponsored by TUBITAK 2232-A Program.

KEYWORDS: Certified reference material, method development, lead, limit of detection.

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[PP59]

PRECONCENTRATION OF BISMUTH USING NICKEL HYDROXIDE NANOFLOWER-BASED SOLID-PHASE EXTRACTION FROM WATER SAMPLES AND DETERMINATION BY FAAS

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Bismuth compounds have been used in cosmetics, pigments, metallurgical additives for casting and galvanizing, as well as in various pharmaceuticals, notably Pepto-Bismol, which has a long history of treating gastrointestinal issues [1]. Bismuth, with a biological half-life of five days in the whole body, exhibits prolonged kidney retention in patients treated with bismuth compounds. Exposure to bismuth can occur through inhalation, ingestion, or skin absorption. Bismuth toxicity primarily impacts the kidney, liver, and bladder [2]. Nanoparticulate bismuth demonstrates higher toxicity compared to other bismuth forms [3]. Normally, bismuth intake through food amounts to around 5–20 µg daily, with significantly smaller quantities coming from air and water sources [4]. Hence, it is important to detect the amount of bismuth even at trace levels. In this study, a dispersive solid-phase extraction method based on $Ni(OH)_2$ nanoflowers (NFs) was developed to separate and preconcentrate bismuth ions from tap water and spring water samples for the determination by flame atomic absorption spectrometry (FAAS). A homogeneous precipitation method was applied to synthesize $Ni(OH)_2$ nanoflowers, which was then used as a sorbent for bismuth preconcentration. The synthesized sorbent was examined using X-ray diffraction, scanning electron microscopy and Fourier-transform infrared spectroscopy. Single variant experiments were carried out for all optimizations of sorption/desorption steps. The optimum conditions of the proposed method were as follows: 120 rpm of 15 minutes mechanical mixing, 1.0 mL of pH 6.0 buffer solution, 20 mg $Ni(OH)_2$ NFs used for the preconcentration and 250 uL 6.0 M nitric acid for desorption for the bismuth ion. According to the experimental results, the calibration plot was linear in the concentration range of 0.02–0.30 mg/L. The enhancement factor was calculated as 138.8-folds with respect to the ratio of the slopes of the regression equations obtained by with and without preconcentration. To evaluate the applicability and reliability of the developed method, optimal conditions were applied to tap water and spring water samples and satisfactory percent recoveries were obtained.

KEYWORDS: Bismuth, $Ni(OH)_2$ nanoflowers, Flame atomic absorption spectrometry, Solid phase extraction, Tap water, Spring water

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[PP60]

SYNTHESIS AND CHARACTERIZATION OF NEW SCHIFF BASES CONTAINING QUINAZOLINE RINGS AND THEIR ANALYTICAL APPLICATIONS

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The demand for assessing pollutants such as toxins and metal ions has grown significantly, particularly in the context of health and environmental applications [1]. The release of cationic and anionic pollutants due to industrial and agricultural activities has escalated the risks to both human health and the environment. Currently, various analytical instrumentation methods such as flame atomic absorption spectrometry (FAAS), inductively coupled plasma optical emission spectrometry (ICP OES), voltammetry, x-ray fluorescence spectrometry and inductively coupled plasma–mass spectrometry (ICP–MS) have been employed to qualify/quantify metal contaminants in several matrices. However, some of these methods are associated with high costs, time-intensive procedures (especially during sample preparation), and limited sensitivity [2]. FAAS systems have low signal to noise ratio due to short residence time of atoms on the analytical line and low nebulization efficiency [3], therefore; several microextraction methods [4] have been applied to decrease detection limit by preconcentrating the analyte(s) prior to FAAS measurement. In the scope of this study, various Schiff bases were synthesized and characterized. In future studies, the synthesized Schiff bases are going to be used as complexation reagent to form several metal-complexes in order to extract with an organic solvent. It is planned to apply a proper liquid phase microextraction method (LMPE) for the extraction and preconcentration of metal analyte(s) after complexation procedure. All significant parameters belonging to complexation and microextraction procedures are going to be optimized to enhance the signal to noise ratio belonging to the analyte(s). After, system analytical performance studies are going to be carried out and recovery studies are going to be performed to evaluate the applicability and accuracy of developed method for real samples.

KEYWORDS: Quinazoline, Schiff Base, Metal Determination, Heterocyclic Compounds, Ligand

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[PP61]

CHARACTERIZATION OF UV ABSORBERS USED IN COATINGS

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In the coating industry, the absorption of Ultraviolet-light by the polymer backbone leads to primary photochemical reactions leading to a photo-oxidative degradation of the polymer [1]. Ultraviolet absorbers play an important role in eliminating degradation effects, e.g. discoloration or peeling, cracking, loss of strength, yellowing, etc. In this regard, the characterization of UV absorbers plays a pivotal role in understanding their optical and chemical properties, thereby enabling their effective application in various fields such as photo-polymerization and photochemical processes [2]. Initially, suitable solvents for each selected UV absorbers are aimed to determine by Hansen solubility parameters (HSP). Literature studies show us that Hansen's approach is the most popular; where solvents are defined by 3 parameters corresponding to dispersion (id), polarity (ip) and hydrogen bond (ih) interactions [3]. Using HSP, single solvents and solvent mixtures were determined and absorbance of additives were measured in these solvents. This study provides a comprehensive investigation into the characterization of UV absorbers as an additive using a combination of Gel Permeation Chromatography (GPC), Ultraviolet (UV) Spectrophotometry, and Fourier-Transform Infrared Spectroscopy (FTIR) analytical techniques. GPC technique is used to determine the molecular weight distribution and polymerization kinetics of selected UV absorbers. The analysis reveals insights into macromolecular structure and polymerization behavior that are crucial for optimizing material performance. UV spectrophotometry allows the evaluation of absorption and transmittance properties in the UV-visible range. These spectrums help evaluate the efficiency of these compounds in absorbing incident radiation and initiating photochemical reactions. On the other hand, FTIR spectrums provide specific information about the chemical functional groups present in UV absorbers. This technique facilitates the identification of characteristic peaks, allowing the determination of chemical composition and potential reaction pathways. By correlating data obtained from GPC, UV spectrophotometry and FTIR, a comprehensive understanding of photo-absorber systems is achieved and their design and applications are improved. In conclusion, the integration of Hansen solubility parameters, GPC, UV Spectrophotometry and FTIR techniques provides a robust approach for the characterization of UV absorbers. This versatile analysis improves our understanding of the optical and chemical properties of UV absorbers paving the way for their effective use in various photonic and photochemical applications.

KEYWORDS: UV Absorber, Hansen Solubility Parameters, UV-Vis Spectrophotometer, FTIR, GPC

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[PP62]

Mg(II) PHTHALOCYANINE COMPOUND BEARING THIOL UNITS: EXAMINATION OF SOME PROPERTIES WITH UV-VIS SPECTROSCOPY

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Cancer is defined as a disease caused by the uncontrolled proliferation of cells in various parts of our body. Although different methods are used for cancer treatment, the search for alternative treatments continues. Today, photodynamic therapy (PDT), an approved treatment method for the treatment of cancer diseases, is attracting attention. PDT ensures the death of the cancerous cell by utilizing the production of singlet oxygen in the presence of a photosensitizer molecule that is activated by light of a certain wavelength [1]. Phthalocyanines are used as photosensitizers in PDT applications. The photosensitizer to be used for PDT applications must primarily have high singlet oxygen production, be selective for cancer cells, absorb at high wavelengths, prevent aggregation, and be soluble [2]. For this reason, it is aimed to prevent aggregation and obtain a soluble compound by adding some functional groups (donor atoms such as crown ethers, alkyl, alkoxy, carboxylate and N, O) to the peripheral position of the phthalocyanine structure. In addition, some central metal ions (such as magnesium) is among the targets [3].

Within the scope of this study, new phthalocyanine compound that are photosensitive and have the potential to be used in various fields as candidates for use in PDT were synthesized using classical methods. In the structure of the phthalocyanine compound, 4,5-diphenyl-1,3-oxasol-2-thiol compound, which contains O, N, S atoms was preferred in order to increase the light absorption power and singlet oxygen production. The synthesis of phthalonitrile-derived ligand was carried out for the first time. Magnesium(II) phthalocyanine containing thiol groups in peripheral positions was synthesized and its structure was characterized by different spectroscopic methods. To investigate the suitability of this compound in PDT, some properties of phthalocyanine compound such as aggregation and photochemical properties were examined by UV-Vis spectroscopy in DMSO and DMF solvents and singlet oxygen quantum yield and photodegradation quantum yield of this phthalocyanine were calculated using photochemical measurements. The results showed that Mg(II) phthalocyanine is a suitable candidate for PDT applications.

KEYWORDS: Aggregation, magnesium, photochemical, phthalocyanine, uv-vis.

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[PP63]

INVESTIGATION OF PHOTOCHEMICAL PROPERTIES OF INDIUM(III) PHTHALOCYANINE CONTAINING THIOL GROUP USING UV-VIS SPECTROSCOPY

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Cancer is one of the subjects where scientists work intensively on treatment methods with its high mortality rate. With developing technology, treatment methods are also improving day by day. In addition to the disadvantages of traditional treatment methods such as chemotherapy in cancer, in recent years the medical world has turned its attention to the new treatment method, photodynamic therapy (PDT). In this method, while healthy cells are not damaged like chemotherapy, it only works on the target tissue [1]. This situation has managed to attract attention in the treatment of cancer, the disease of the age, by minimizing the side effects of the treatment. The requirements of the PDT method are collected under only three main headings; light, photosensitizer, reactive oxygen species. The photosensitizer substance interacts with light and destroys cancer cells with the reactive oxygen species it produces. In this context, a phthalocyanine structure that can effectively reach the target cell by increasing reactive oxygen production and interact with light with the 18π electron system it contains has been designed. Phthalocyanine compound provides high quantum efficiency, long lifetime and efficient singlet oxygen production. 4,5-diphenyl-1,3-oxasol-2-thiol compound, which contains O, N, S atoms was selected because it can increase solubility and can enhance the light absorption power and singlet oxygen production [2]. In addition, In^{+3} metal was used as the central metal atom of phthalocyanine [3].

Herein, new phthalocyanine containing Indium(III) metal and thiol groups on tetra substituted peripheral positions was synthesized and its structure was characterized by various spectroscopic techniques. The solubility and aggregation properties of the phthalocyanine compound were examined by UV-Vis spectroscopy. To investigate the applicability of this compound in PDT, its photochemical properties were investigated by UV-Vis spectroscopy in DMSO and DMF solvents. Singlet oxygen quantum yields and photodegradation quantum yields were calculated. The results showed that the phthalocyanine compound has exhibited very good photochemical properties and was a potential candidate for PDT applications.

KEYWORDS: Phthalocyanine, UV spectroscopy, photodynamic therapy (PDT), photochemical.

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[PP64]

THE CHARACTERIZATION OF ORGANIC BASED BLOCKED ACID CATALYSTS

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Organic acid catalysts such as para-Toluene sulfonic acid (pTSA), dinonyl naphthalene sulfonic acid (DNNSA), and dinonyl naphthalene disulfonic acid (DNNDSA) are preferable additives that are used in the coating industry. However, these forms of sulfonic acid are not reliable for coating because of their lifetime and durability for cross-link reactions at low temperatures. Therefore, acid catalysts are blocked to be reactive at high temperatures [1]. Acid blockages can be carried out either with the neutralization of an acid with an amine molecule such as tertiary amines or covalent bond blockages with esterification. Covalent bonds and neutralization with amine blockages can stabilize the coating system concerning their application techniques. p-TSA blocked with amine compound is influenced by the volatility of amine. If highly volatile amine is preferred, surface defects can appear. Besides that, covalent-blocked acids can be used for longer cure schedules according to amine-blocked due to a more stable and irreversible reaction medium [2]. For all reasons, it is important to discover the structure of blockages and whether is covalent-blocked or amine-blocked type. In this work, both amine and covalent blocked acid catalysts with p-TSA and DNNSA samples were studied to obtain structure and their blocking mechanism by using FTIR (Fourier-Transform Infrared Spectroscopy) and Pyrolysis-Gas Chromatography/Mass Spectrometry (Pyr-GC/MS). As a result, in FTIR analysis of amine-blocked p-TSA, characteristic bonds were observed for N-H stretching at 1630 cm^{-1} and 3400 cm^{-1}, while covalent-blocked p-TSA has C=O stretching at 1730 cm^{-1}. Also, GC/MS and GC/FID systems were used to obtain volatile amine content for amine-blocked samples without any derivatization. For Pyr-GC/MS analysis, all samples were derivatized with two derivatization agents and underwent methylation and silylation processes to get more information about their structure. After derivatization studies, it is found that amine-blocked samples include tertiary allyl amine, morpholine, and pyridine fragmentation while covalent-blocked samples contain oxirane structures which can provide the esterification of organic acids.

KEYWORDS: Blocked Organic Acids, Coating, Pyr-GC/MS, FTIR

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[PP65]

GENOTOXICITY ASSESSMENT OF CARBON NANO DOTS SYNTHESİZED FROM *Citrus reticulata*

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With the development of carbon-based nanomaterials, carbon dots (CDs) have recently received increasing attention owing to their unique optical properties, low toxicity, facile synthesis, abundance and inexpensive precursors. Although carbon nanoparticles or quantum dots (C-dots) have been studied extensively for a variety of applications (e.g. photocatalysis, metal ion sensing, antibacterial, cell labelling), a greener synthetic method is highly indispensable. In this study, the carbon nanodots (CNDs) were synthesized using a microvawe assisted hydrothermal process from *Citrus reticulata* and the genotoxic effects of this material were investigated in *Daphnia magna*. Acute and chronic toxicity experiments were carried out based on the standard methodology of the Organization for Economic Cooperation and Development (OECD) 202 and 212 guidelines[1-2]. Using the OECD method (202), different concentrations of CNDs from *Citrus reticulata* were subjected to *D. magna* in time periods of 96 h at 20°C. Based on the toxicity levels as determined by the Globally Harmonized System of Classification and Labelling of Chemicals, CNDs belong to the medium toxic category [3]. Toxicological evaluations of sublethal concentrations of CNDs was also performed. Although the DNA damage frequency of two CNDs groups was higher than the control group, these levels was found to be almost seventy percent lower than the DNA damage frequency of the mutagenic group/positive control group. Moreover, according to ISO10993-5, CNDs were classified as non-cytotoxic on *D. magna* for the studied concentrations [4]. To the best of our knowledge, this is the first research performed to evaluate the cytotoxic and genotoxic effects of CNDs from *Citrus reticulata* on *D. magna*.

KEY WORDS: Carbon nanodots, *Citrus reticulata*, nanotoxicology, model organism

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[PP66]

SYNTHETIC HYRDROXYAPATITE COATED WITH METAL ORGANIC FRAMEWORK FOR REMOVAL OF HEAVY METAL IONS FROM ENVIRONMENTAL SOLUTIONS

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Heavy metal pollution in water has become global concern for environment and public health, due to the toxicity of metals. Metal processing, electroplating, battery manufacturing and mining are such industries that considerable volume of heavy metal effluent is produced [1]. Most of the heavy metals are needed for nature as micronutrients at low levels. However, heavy metals in high concentrations that permeate the human body can harm essential organs, the circulatory, neurological, and immunological systems [2]. Moreover, they pose serious hazards to environment [3]. There are several scientific researches about hydroxyapatite that have an excellent capability for the removal of various heavy metal ions from wastewater and contaminated soil. On the other hand, metal-organic frameworks (MOFs) show interest to heavy metals with large surface area and porousness [4]. In this present study, a novel adsorbent was prepared by coating in-situ synthesized sorbent with Ni- Zn- Cu based MOFs in order to remove heavy metals (Pb , Cr and Cd) from environmental aqueous solutions. The experimental parameters such as pH, initial metal ion concentration and adsorbent dosage were evaluated. Overall, synthesized eco-friendly and effective adsorbent may be used to remove heavy metal ions from contaminated water.

KEYWORDS: Solid phase extraction, MOFs, heavy metal ions, contaminated water.

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[PP68]

3D PRINTING OF ELECTRODES AND INVESTIGATION OF THE EFFECT OF SURFACE ACTIVATION ON SURFACE PROPERTIES

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3D printers, which have attracted much attention with the widespread use of 3D technology today, can be defined as machines used to design a product in a computer-aided environment and print the final product. The widespread use of 3D technology plays an important role in making 3D printed electrodes preferable to ready-made electrodes used in electrochemical analysis. On the other hand, since the electroanalytical performance of carbon-based 3D electrodes can be low when used in their natural state, various physical, chemical and electrochemical activation processes are used after printing to overcome this [1] [2].

In this study, surface activation of 3D working electrodes printed with polylactic acid/carbon black conductive filament was carried out using two different methods: solution based activation and electrochemical activation. The activation processes were performed in 0.5 M H_2SO_4 and 2.0 M NaOH solutions at different time intervals and potentials. Unactivated and activated electrode surfaces were characterized by electrochemical and microscopic techniques. The electrochemical characterization was carried out using the cyclic voltammetry technique and the electrochemical impedance spectroscopy. Scanning electron microscopy and atomic force microscopy were used for microscopic characterization. When the voltammograms obtained as a result of the electrochemical characterization were evaluated, it was concluded that the best electrode surfaces were those activated in 0.5 M H_2SO_4 solution for 30 minutes and in 2.0 M NaOH solution for 60 minutes and in 0.5 M H_2SO_4 solution at 13 V potential for 15 minutes. When the scanning electron microscope images were investigated, it was observed that the most homogeneous electrode surface was the electrode surface activated in 2.0 M NaOH solution for 60 minutes, while there were cracks on the electrochemically activated electrode surfaces. When the average roughness values were investigated by atomic force microscopy, it was found that the electrode surface with the lowest average roughness value was the electrode surface activated in 0.5 M H_2SO_4 solution for 30 minutes.

KEYWORDS: activation in solution, electrochemical activation, electrochemical characterization, 3D printed electrode

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[PP69]

PERFORMANCE EVALUATIONS of CATAPHORESIS COATING THICKNESS AFTER PRE-TREATMENT on VARIOUS CONDUCTIVE SURFACES

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Metals and alloys are indispensable fundamental materials in the industry. Corrosion is the degradation of all kinds of materials, especially metals and alloys, due to various effects. Corrosion is an undesirable occurence, causing significant economic losses for every country [1]. Coating and painting processes are applied to protect metals from wear and corrosion. Among these processes, cataphoresis is a water-based primer coating applied to metal surfaces based on the principles of electrochemistry. Cataphoresis coating can be applied to all metals with conductive properties [2]. Cataphoresis coating provides protection of all automobile bodies against corrosion [3]. The corrosion resistance of the cataphoresis coating can be analyzed through the salt fog test. When comparing cataphoresis, zinc phosphate, iron phosphate and autophoresis coatings in terms of performance, cataphoresis exhibits the highest salt test resistance [3]. Salt fog testing is conducted according to ASTM B 117 and DIN EN ISO 9227 standards. After the plates prepared according to the test standards are coated, they are placed in a salt fog cabinet that sprays 5% sodium chloride at a constant temperature of 35°C and a humidity of 95%. Red rust is an indication that corrosion has reached the metal environment [4].

In this study, a Salt Fog Resistance Test analysis will be carried out in accordance with the automotive specification ASTM B 117/ DIN EN ISO 9227 by applying cataphoresis coating to DKP, aluminum and galvanized plate parts by applying minimum and maximum voltage according to the feature of the facility used, and proportioning the coating thicknesses.

As the applied voltage increases, it is expected that the resistance to corrosion resistance will increase as the coating thickness increases. It is observed that the salt fog test resistance is higher in plates with high coating thickness. According to the results obtained, adding some additives to the coating processes may be an opportunity for future researchers in coating.

KEYWORDS: Voltage, time, conductivity, coating thickness, cataphoresis

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[PP70]

DETERMINATION OF HYDROXYLAMINE AT POLY-CURCUMIN-MODIFIED PENCIL GRAPHITE ELECTRODE

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Hydroxylamine (HA) is commonly used in the pharmacy, semiconductor, chemical, and pharmaceutical industries [1]. It can cause mutations in plants, animals, and humans as a result of exposure [2]. HA is irritating to organs such as the skin and eyes, and it may cause anemia with prolonged exposure. [3]. The recommended daily allowable dose for HA has been reported as 2 µg per day [4]. In addition, HA is difficult to determine in natural samples due to its instability and brittleness [3]. Thus, this study describes the development of a sensitive electrochemical method for the determination of HA at a disposable pencil graphite electrode (PGE). In this context, the PGE surface was modified by electropolymerization of curcumin (Cm) by recording 10 successive cyclic voltammograms (CVs) of 1.0 mM monomer in ACN containing 0.1 tetrabutylhexaflorophosphate at 50 mV/s. After, the spectroscopic and electrochemical characterization of poly-Cm/PGE, it was used for the electrocatalytic oxidation of HA. CVs show that poly-Cm/PGE exhibits a good electrocatalytic response compared with non-polymeric PGE. Amperometric current-time curves of HA were recorded at 200 mV vs. Ag/AgCl in a pH 10 Britton Robinson buffer solution under stirring of the solution at 1000 rpm. Based on the results obtained from amperometric studies, the poly-Cm/PGE exhibits a linear response range between 0.50 µM and 500 µM ($R^2 = 0.9984$) with a detection limit of 0.15 µM. The developed electrochemical method was also applied to real samples (pharmaceutical and water samples). Recovery results were found in the range of 106.5–108.5% for spiked water samples. In addition, the hydroxyurea, which is an active pharmaceutical and hydrolyzed to HA, was successfully determined by the developed amperometric HA sensor. It can be concluded that the proposed method can provide fast, practical, low-cost, high-accuracy, and sensitive HA determination in real samples.

KEYWORDS: amperometry, electrochemistry, electropolymerization, hydroxylamine, sensors

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[PP71]

ULTRA-SENSITIVE SIMULTANEOUS ELECTROCHEMICAL DETECTION OF Zn(II), Cd(II), Pb(II) AND Cu(II) IN SURFACE WATER AND CERTIFIED REFERENCE WATER SAMPLES

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Heavy metals are contaminants that can cause toxic effects in the environment, food, water, and biological samples. The most common heavy metal contaminants are Cr, Mn, Cd, Cu, Ni, Zn, and Pb, and they can have dangerous effects on health and the environment [1,2]. In particular, contamination of surface and underground water sources with heavy metals poses an important environmental problem for human health [3]. Therefore, analyzing the toxic effects of heavy metals in these samples is important. Among the many analytical methods for analyzing heavy metals in water, electrochemical methods are often preferred due to their advantages, such as being cheap, providing fast and on-site analysis, portability, high sensitivity, and low detection limit [4].

In this study, disposable and portable screen-printed carbon electrodes (SPCE) modified in situ with bismuth (Bi) and mercury (Hg) film (Bi/Hg-SPCE) were prepared to obtain simultaneous, sensitive, and low detection limits of zinc(II), cadmium(II), lead(II) and copper(II) ions by square wave anodic stripping voltammetry (SWASV) method. The characterization of the film-coated electrode surfaces was characterized by energy-dispersive X-ray spectroscopy (EDS), electrochemical impedance spectroscopy (EIS), and cyclic voltammetry (CV). Bi/Hg-SPCE film sensor formed low detection limits for Zn(II), Cd(II), Pb(II), and Cu(II) ions, which are 0.97 ppb, 0.16 ppb, 0.082 ppb, and 0.64 ppb, respectively. In addition, the developed Bi/Hg-SPCE sensor exhibited excellent repeatability (RSD < 4.0%), and reproducibility (RSD < 4.0%), and demonstrated good analytical performance with reasonable interference effects from various inorganic species. The developed sensor was applied to a certified reference water sample (CRM) and a surface water sample taken from Zilek (Southeast Anatolia) stream using the standard addition method, and the results were satisfactorily. Analytical results obtained are comparable to those obtained by inductively coupled plasma mass spectrometry.

KEYWORDS: Heavy metals, stripping voltammetry, screen printed electrode, bismuth film, mercury film.

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[PP72]

EXTRACTION OF ANTIOXIDANTS FROM BLACK CARROT POMACE BY USING MICROWAVE ASSISTED EXTRACTION AND ITS USING FOR GREEN SYNTHESIS OF SILVER NANOPARTICLES

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In Türkiye, the black carrot (*Daucus carota* L.) is an important agricultural product that ranks first in the world production rankings. Black carrot contains significant amounts of antioxidants such as anthocyanins, caffeic acid, and chlorogenic acid. Antioxidants are natural compounds that prevent the formation of free radicals that can cause damage to the body and neutralize their reactions. On the other hand, black carrot is used in various applications, particularly in turnip juice, and it generates significant waste. Although these waste pomaces are used as animal feed unconsciously, they cannot be used efficiently and pollute the environment. Biomolecules in black carrot pomace, a renewable waste, have the potential to be suitable reducing, coating, and stabilizing agents for the green synthesis of silver nanoparticles (AgNPs). AgNPs are known metal nanoparticles for their extraordinary biocompatibility and have demonstrated numerous properties by being used in antimicrobials, wound healers, biosensors, drug delivery agents, biomedical devices, and catalysts [1,2]. Green synthesized AgNPs produced with phytochemicals show significant in vitro antioxidant potential. In this work, black carrot extract was obtained with a microwave extraction system, and solvent type, solvent ratio, temperature, and time parameters were optimized. Then, AgNPs synthesized via green synthesis using this extract were characterized by Ultraviolet-Visible (UV-Vis) spectroscopy. After the characterization process, the total antioxidant capacity and free radical scavenging activities of the nanoparticles obtained were examined and their antioxidant properties were investigated. In addition to reducing the environmental waste problem by using the black carrot pulp produced as waste, AgNPs obtained through green synthesis using the pomace will also have the potential to be used in new studies in the fields of nanosensors and nanomedicine. This work has been supported by TUBITAK (Turkish Scientific and Technical Research Council) with the research project 1919B012214547.

KEYWORDS: Anthocyanins, black carrot, green synthesis, microwave-assisted extraction, silver nanoparticle.

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[PP73]

ELECTROCHEMICAL DETERMINATION OF ANTIOXIDANT GALLIC ACID BASED ON METAL NANOPARTICLES DECORATED NATURAL MINERAL USING ECO-FRIENDLY ELECTROCHEMICAL NANOSENSOR

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Polyphenols are important to human health and necessary to identify and quantitative methods for their detection. Gallic acid (3,4,5- trihydroxybenzoic acid), one of the major phenolic acids, is a well-known antioxidant compound and found in various fruits, tealeaves and beverages. It is also widely used in the food, cosmetic and pharmaceutical industry due to its antioxidant, anti-carcinogenic, anti- inflammatory, antimicrobial, and antifungal properties (1,2). Because of these properties, recently, the detection of gallic acid has become one of the leading research topic.

Nano-structured materials are gaining attention in electrochemical sensor studies. Metal nano participles have provided high surface area and great catalytic activity and enhanced oxidation peaks. Kaolinite ($Al_2Si_2O_5(OH)_4$) is a natural clay (1 : 1) layered formed by position of an alumina octahedral sheet and a silica tetrahedral sheet. Due to good adsorption capacity, high chemical stability, layered structure, low cost, eco-friendly properties, it is noteworthy to mentioned that the utilization as a platform in nanomaterials (3,4).

In this study, an electrochemical nanosensor was developed to detect gallic acid based on coating the surface of a screen-printed carbon with gold nanoparticles and kaolinite mineral.

The electrochemical characterization of the modified electrode was carried out by cyclic voltammetry and electrochemical impedance spectroscopy. The surface morphology of the electrode was investigated by scanning electron microscopy. The differential pulse voltammetry was used for the determination of gallic acid. The linear working range was determined in the linear range of ($1.749 \times 10^{-9} - 4.0 \times 10^{-5}$) M with a low LOD of 5.249×10^{-10} M, and LOQ of 1.749×10^{-9} M. The reproducibility and repeatability of the electrode were investigated. Finally, the proposed model sensor was successfully applied for monitoring GA in black tea samples.

KEYWORDS: Gallic acid, Black tea, Gold nanoparticles, Kaolinite, Screen printed electrode, Voltammetry

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[PP74]

COST-EFFECTIVE AND SENSITIVE VOLTAMMETRIC DETERMINATION OF FENHEXAMID USED AS A FUNGICIDE WITH A DISPOSABLE PENCIL GRAPHITE ELECTRODE

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Fungicides are often used to control parasitic fungi that damage plants, including rusts, mildews, and blights. They protect target plants from fungal diseases by killing fungi and their spores or by preventing their growth. [1] Fenhexamid (FHX) is one of the most common fungicides used to prevent fungal diseases in fruits and vegetables, especially grapes. [2] Although FHX is a very useful fungicide in the field of agriculture, it can be released into the environment and have a harmful effect on humans and the aquatic environment. Therefore, the determination of FHX is of great importance in terms of food production quality, human health, and environmental protection. Recently, several electrochemical methods have been developed by Skrzypek et al. [1,2] to determine FHX residues in fruit samples, as well as chromatographic methods [3,4] that have been extensively used.

This study describes the voltammetric investigation of FHX based on both its reduction and oxidation using an inexpensive and disposable pencil graphite electrode (PGE). According to our literature search, there is no study available for the determination of FHX by using PGE. The electrochemical oxidation and reduction mechanisms of FHX were studied by recording cyclic voltammograms based on the various pHs of the supporting electrolyte and various scan rates at pH 2.0 of a Britton Robinson buffer (BRB) solution containing 0.10 M KCl. The operation parameters for differential pulse voltammograms were optimized as a pulse time of 2 ms and scan rate of 50 mV/s for both anodic and cathodic peaks, a pulse amplitude of 180 mV and 200 mV, and a step potential of 10 and 15 mV for anodic and cathodic peaks, respectively. The results obtained from studies in anodic direction show that FHX has two different linear response ranges between 0.001-0.1 µM and 0.1-5.0 µM with a detection limit of 0.34 nM FHX. On the other hand, linear ranges between 0.001 -0.1 and 0.1-5.0 µM and a detection limit of 0.33 nM were obtained from the results in the studies of cathodic direction. The selectivity of the proposed methodology is at an acceptable level since some pesticides and some cationic species examined did not show any interference effect on the voltammetric determination of FHX. Recovery results close to 100% obtained from real samples with added FHX show that FHX in water samples (tap and irrigation water) can be determined with high accuracy.

KEYWORDS: Fenhexamid; Fungicide; Pencil graphite electrode; Voltammetry; Electrochemical Determination

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[PP75]

SELECTIVE AMPEROMETRIC SENSOR FOR DETECTION OF HYDRAZINE AT GOLD NANOPARTICLES DECORATED POLY(BRILLIANT BLUE) MODIFIED ELECTRODE

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Hydrazine has attracted increasing interest due to its wide range of applications in diverse fields such as industry, agriculture, pharmaceuticals, military and aerospace [1]. In addition to being an essential component in rocket propulsion systems, hydrazine is also used in the production of pharmaceutical intermediates, pesticides, photographic chemicals, metal films, and many other products [2]. The neurotoxic properties of hydrazine have been shown to cause carcinogenic and mutagenic effects on the body. Prolonged exposure could lead to numerous health problems, including temporary blindness, nausea, throat irritation, dizziness, lung edema, and even coma. Furthermore, hydrazine has been linked to damage to the hemolysis, liver, kidneys, and nervous system [3]. The prevalence of these cases highlights the importance of accurate and quantitative analysis. Therefore, due to its significant relevance and toxicity, there is a need for a rapid, selective, and sensitive approach to analyze hydrazine. Electrochemical methods provide a fast, wide linear concentration range, miniaturization, low cost of instrumentation and accessible technique for the determination of hydrazine among all detection methods, including chromatography, colorimetry, spectroscopy, and chemiluminescence [1].

In this study, gold nanoparticles (AuNPs) and poly(brilliant blue) (P(BB)) modifiers were applied to pencil graphite as an electrode platform for the electrochemical detection of hydrazine. Modification processes for AuNPs and P(BB) were carried out using chronoamperometry and cyclic voltammetry, respectively. The developed sensor was characterized using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), and energy dispersive X-ray spectroscopy (EDX). The determination was conducted using the amperometry method, which is one of the electrochemical techniques. The study investigated the potential interference of species in real samples on the analysis. Water and mineral water samples were selected as real samples to test the applicability of the developed method.

KEYWORDS: Amperometry, electrochemical sensor, gold nanoparticles, hydrazine, poly(brilliant blue).

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[PP76]

PREPARATION OF CONDUCTIVE INK CONTAINING NANOMATERIAL AND INVESTIGATION OF FLEXIBLE ELECTROCHEMICAL SENSOR PROPERTIES FOR TYROSINE DETERMINATION

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Tyrosine is a crucial amino acid among the 20 standard amino acids that play a vital role in maintaining a positive nitrogen balance in the body and acting as a fundamental building block for synthesizing multiple proteins [1]. Moreover, tyrosine is responsible for synthesizing many hormones and neurotransmitters, including dopamine, adrenaline, epinephrine, norepinephrine, melanin, thyroxine, and estrogen. The lack of tyrosine could lead to severe diseases such as autoimmune disorders, tyrosinemia, phenylketonuria, and dementia. For these reasons, measuring this valuable aromatic biomarker through point of care presents a significant opportunity for the early diagnosis and monitoring of metabolic or neurodegenerative diseases [2]. Several analytical techniques, such as high-performance liquid chromatography, capillary electrophoresis, surface-enhanced Raman scattering, fluorimetry, and enzyme-based methods, have been developed for detecting Tyr. However, these methods require tedious and multi-step sample cleanup procedures, expensive assays, specialized instrumentation, and skilled personnel. On the other hand, electrochemical detection methods have become increasingly popular for detecting amino acids, such as Tyr, due to their high sensitivity, ease of use, selectivity, real-time response, and low-cost [3]. The development of reliable, affordable, easy-to-manufacture, and miniature devices has been accelerated by the growing need for disposable and adaptable electrodes in electrochemical analysis methods [4].

For these reasons, in this study, due to the advantages of flexible and disposable electrodes, conductive inks were integrated on flexible substrates such as paper, polyethylene terephthalate, and polyimide. However, nanomaterials have been incorporated into the conductive ink for the design of flexible sensors. Using these electrodes, the electrochemical properties of tyrosine has been analyzed and characterized analytical methods such as cyclic voltammetry, electrochemical impedance spectroscopy, Fourier-transform infrared spectroscopy, scanning electron microscopy, and energy dispersive X-ray spectroscopy.

KEYWORDS: Conductive ink, flexible electrode, electrochemical sensor, tyrosine, cyclic voltammetry.

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[PP77]

EVALUATION OF THE TYROSINASE INHIBITORY ACTIVITY OF THE SKIN CREAM PREPARED WITH WALNUT SHELL, MEDICINAL CHAMOMILE, MORINGA OIL, ARBUTIN, AND KOJIC ACID

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Human vitiligo is a common skin disorder characterized by irregular depigmentation due to the loss of melanin-producing cells or melanocytes in the epidermis [1]. Vitiligo is a hypopigmentation disorder that affects 1% to 4% of the world population. Half of the cases manifest before age 20, and disfigurement leads to psychiatric morbidity in 16% to 35% of affected individuals [2]. Its etiology remains unknown, but evidence suggests an autoimmune-mediated disease mechanism. Vitiligo patients exhibit specific melanocyte losses, raising the possibility that one or more key enzymes involved in melanin synthesis may be significant autoantigens in the pathogenesis of the disease. Key enzymes in melanin synthesis are tyrosinase and tyrosinase-related proteins, whose molecular weights are calculated at 62 kDa [3]. Systematic reviews have suggested the potential use of topical immunomodulators, but their serious side effects require further evaluation. Systematic studies by Whitton [4] and Forschner [5] indicate that using L-phenylalanine combined with phototherapy appears promising but requires further investigation before definitive conclusions can be reached. An antioxidant and mitochondrial stimulant cream formulation was evaluated in patients with stable vulgar vitiligo in their leukodermic areas. The best results were reported in the combination of the antioxidant and mitochondrial stimulant cream and oral administration of antioxidants and phenylalanine [6].

In this study, walnut shells, medicinal chamomile, moringa oil, arbutin, and kojic acid were used in a natural skin cream that could potentially exhibit medical activity against vitiligo. The inhibition activity of the cream prepared for tyrosinase enzyme [7] was assessed to evaluate its relationship with vitiligo. The results having potentials were compared with kojic acid.

KEYWORDS: Tyrosinase inhibition activity, skin cream, walnut shell, medicinal chamomile, moringa oil, arbutin, kojic acid.

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[PP78]

PREPARATION OF NANOPARTICLE-BASED CONDUCTIVE INK FOR ELECTROCHEMICAL DETERMINATION OF URIC ACID AND INVESTIGATION OF FLEXIBLE SENSOR PERFORMANCE

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Uric acid (UA) is a biomolecule formed as a result of the decomposition of purine nucleotides in purine metabolism. UA plays a crucial role in both physiological and pathological aspects of the human body. Abnormal UA levels act as a biomarker in diagnosing cardiovascular and renal diseases, primarily gout. Various techniques have been proposed for the detection of UA, including colorimetry, fluorescence analysis, chromatography, and capillary electrophoresis. However, their practical usability is restrained by the excessive costs, laborious processing, and susceptibility to interference from other compounds. In recent years, the electrochemical method has emerged as a promising alternative due to its fast analysis speed, affordability, and low detectable concentration. Consequently, it has become an ideal approach for UA determination [1,2]. Flexible electrochemical sensors have numerous potential applications that span all areas of life, indicating that wearable electronics can improve daily living by promoting easier, safer, and healthier lifestyles. They offer real-time, continuous monitoring of human health. A thorough analysis of flexible electrical designs reveals the crucial role of conductive inks, as evidenced by existing literature. Conductive inks consist of three main components, namely conductive filler, binder, and solvent. Nanoparticles (NPs) are commonly utilized as conductive fillers in these inks [3].

In this study, nanoparticle based conductive ink coated flexible electrodes were developed for the determination of biologically important uric acid. Methods such as cyclic voltammetry, scanning electron microscopy, energy dispersive X-ray spectroscopy, and electrochemical impedance spectroscopy were used to characterize the developed flexible electrodes. In addition, the effect of various species that may coexist with UA in real samples on the analysis was investigated. It is possible to say that the developed flexible electrode is a step towards developing a portable measuring device for the direct detection of UA.

KEYWORDS: Uric acid, flexible electrode, conductive ink, metal nanoparticle, sensor.

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[PP79]

PREPARATION OF CONDUCTIVE INK CONTAINING METAL NANOPARTICLES/GRAPHENE FOR DOPAMINE DETERMINATION AND INVESTIGATION OF FLEXIBLE ELECTROCHEMICAL SENSOR PROPERTIES

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Dopamine (DA), one of the brain's neurotransmitters for neural transmission between neurons, controls stress responses, consciousness, learning, motivation, movement and memory formation [1]. Abnormal concentrations of DA produced in the central nervous system are associated with neurological and physiological diseases [2,3]. Various techniques such as photospectrometry, chromatography and mass spectrometry are used for the detection of DA. However, electrochemical methods are preferred due to their ease and low cost, high sensitivity, rapid results, and low detection limits. The reason why electrochemical flexible sensors are needed for the determination of all neurotransmitters, especially dopamine, is that flexible material with an elastic modulus comparable to brain tissue is needed to reduce immunoreaction risks.

Conductive inks developed for flexible electronic applications can use carbon, organic compounds and metal nanoparticles, as well as their combinations or composite materials. Conductive inks are basically composed of conductive material, a binder to increase the affinity of the ink to the substrate in terms of mechanical strength, and solvent, which acts to suspend the other components and gives the ink the desired viscosity according to the chosen printing techniques. Another important parameter for the development of screen printing technology, which refers to the sequential placement of different ink layers on various inert substrates, is the choice of the electrode substrate on which the ink is printed.

Therefore, this study evaluated the suitability of conductive inks prepared with a mixture of bimetallic nanoparticles and doped-graphene to fabricate disposable electrochemical sensors. The flexible electrode was characterized by Fourier-transformed infrared spectroscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy, cyclic voltammetry, and electrochemical impedance spectroscopy. The results show that the sensor can provide an effective tool for monitoring neurotransmitters in the human body.

KEYWORDS: Conductive ink, flexible electrode, dopamine, screen-printed electrode, nervous system.

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[PP80]

PREPERATION OF CONDUCTIVE INK CONTAINING HETEROATOM DOPED GRAPHENE AND FLEXIBLE SUPERCAPACITOR APPLICATION

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Nowadays, there is an increasing demand for wearable electronic devices that are flexible and easy to use. The design of wearable electronic devices that can be bent and rolled depends on the development of flexible batteries and supercapacitors [1]. Studies in recent years have been reported on conductive ink, which is fabricated with printing on flexible substrates for many applications are required conductivity. Conductive inks can be made of various advantageous materials are nanoparticles, metal oxides, conductive polymer, carbon nanotubes and graphene [2]. Recent research has shown that graphene and its derivatives can be used to make conductive inks used for electrochemical energy storage devices [3]. Carbon materials, including graphite and graphene, serve as popular active electrode materials in flexible supercapacitors due to their large surface area, controllable pore size distribution, and impressive cycling performance [4].

In this study, polyester/viscose blended fabric surface was coated with conductive ink including heteroatom-doped graphene. This coating process was carried out ‘dip and dry’ method. The electrochemical characterization of the prepared fabric electrodes was carried out using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and the supercapacitor performance was investigated by charge-discharge tests. Furthermore, scanning electron microscopy (SEM) images were recorded to characterize the surface morphology of the developed flexible electrodes. According to the charge-discharge test results, it is possible to say that the heteroatom doped graphene-based flexible fabric electrode shows a significant specific capacitance and cycle life.

KEYWORDS: Flexible supercapacitor, fabric electrode, conductive ink, doped graphene.

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[PP81]

DEVELOPMENT OF CONDUCTIVE POLYMER BASED ELECTROCHEMICAL SENSOR FOR DETERMINATION OF VITAMIN B2

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Vitamins are essential compounds for human biochemistry and metabolism. Among the water-soluble B vitamins, Riboflavin (RF) plays a crucial role in the utilization of energy sources like proteins, fats, and carbohydrates [1]. RF promotes cell growth and regeneration and is commonly found in food and medicinal products. Since the human body is unable to naturally synthesize RF, consumption of dietary supplements, such as milk, cheese, tea, eggs, vegetables, and liver, is necessary to obtain it [2]. Several methods are available for VB2 analysis in foods and pharmaceuticals, including chromatography, fluorescence, and spectroscopy. However, these methods have disadvantages such as expensive instrumentation and tedious procedures [3]. On the other hand, electroanalytical methods are an efficient way to analyze VB2, as it is an electroactive species. Such methods are generally cost-effective, provide superior sensitivity and selectivity in analysis, and offer rapid results [4]. Conducting polymers used as modification agents in electrochemical sensor design have many advantages such as high sensitivity, ability to modify physical and chemical properties through the use of different substituents [5].

In this study, firstly, a sensor platform was developed using conductive polymer-based electrodes, and the electrochemical properties of riboflavin were investigated. Optimized experimental conditions were determined for the detection of vitamin B2 with the developed sensor. Then, methods such as cyclic voltammetry, electrochemical impedance spectroscopy, Fourier-transform infrared spectroscopy, and scanning electron microscopy were used to characterize the sensor.

KEYWORDS: Vitamin, riboflavin, conductive polymer, voltammetry, sensor.

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[PP82]

DEVELOPMENT OF FLEXIBLE SENSOR BASED ON NANOMATERIAL FOR ELECTROCHEMICAL DETERMINATION OF TYROSINE, AN IMPORTANT BIOMOLECULE IN NEUROSCIENCE

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Amino acids are the building blocks of proteins and their deficiency may lead to various diseases. Tyrosine (Tyr) is an amino acid that is structurally similar to phenylalanine, with a hydroxyl group attached to the phenyl ring in the R group. An abnormal concentration of tyrosine may lead to Parkinson's disease, dementia, albinism and depression [1]. Although methods such as fluorescence, electrophoresis and chemiluminescence could be used, electrochemical methods provide a cost-effective, fast and accurate outcome [2]. The aim of this study is to determine tyrosine using a conductive ink-prepared screen-printed electrode (SPE). The ink is prepared in three stages as a solvent, binder, and conductive filling material. Water and ethanol are used as solvents, with the aim of evaporating quickly and harmlessly to the human body. Carbon-based nanomaterials, which have superior properties in areas such as electrical conductivity, mechanics, thermal and optics, are currently of great interest and are used as conductive fillers [3]. Gold nanoparticles used as conductive filler material along with carbon-based nanomaterials are small-sized and biologically compatible particles with superior properties such as high surface area-to-mass ratios [4].

In this study, the detection of tyrosine will be performed using screen-printed electrodes developed with conductive ink containing gold nanoparticles. The developed handmade screen-printed electrodes will be characterized using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and scanning electron microscopy (SEM). The applicability of the developed electrode will be tested in real samples.

KEYWORDS: Neuroscience, tyrosine, gold nanoparticles, flexible sensor, cyclic voltammetry.

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[PP83]

SnO_2 NANOPARTICLES/ RECYCLED WASTE HAZELNUT SHELL CARBON MODIFIED GLASSY CARBON ELECTRODE AS A VOLTAMMETRIC NANOSENSOR FOR THE SENSITIVE DETERMINATION OF PHENOLIC COMPOUND IN BIOLOGICAL AND BEVERAGE SAMPLES

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Catechol (o-benzenediol, 1,2-benzenediol, or 1,2-dihydroxybenzene) (CC) is a natural polyphenolic molecule found in teas, beverages, vegetables, fruits, and tobaccos [1]. CC has received a lot of attention due to its biological value, which includes antioxidation, antiviral, and influencing the activity of various enzymes [1]. On the other hand, rapid and sensitive detection of CC, a periodic environmental pollutant with low degradability and high toxicity in the ecological environment, is critical [1]. In this study, for the first time, a new and green electrochemical detection platform was developed for the detection of CC through green carbon material (HZ) recycled from waste hazelnut shells with the hydrothermal carbonization technique (HTC) and SnO_2 nanoparticles (NPs). The prepared nanomaterials were characterized through Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-ray diffraction analysis (XRD), X-ray photoelectron spectroscopy (XPS), Raman spectroscopy, and Brunauer-Emmett-Teller (BET), analysis techniques, respectively. On glassy carbon electrode (GCE) with an HZ-SnO_2 modification, the effects of pH, the supporting electrolyte, and the scan rate on the electrochemical behavior of CC were investigated. The method showed excellent analytical performance at nano-detection levels (8.51 nM). Also, the proposed method has been performed to detect the CC in human urine, fruit juice, and green tea samples with sufficient accuracy and precision.

KEYWORDS: Voltammetry, adsorptive stripping differential pulse voltammetry, catechol, waste hazelnut shell, hydrothermal carbonization technique, modified electrode.

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[PP84]

WELL-DISSIPATED CARBON NANOTUBES and POLYELECTROLYTE BASED SENSOR ELECTRODE APPLICATION FOR DIRECTLY VOLTAMMETRIC MEASURE of TATP AND HMTD

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Organic peroxides like triacetone triperoxide (TATP) and hexamethylene triperoxide diamine (HMTD) are particularly challenging to detect, as they lack the nitro groups and aromatic functionalities that are commonly found in high explosives such as trinitrotoluene or 1,3,5,7-tetranitro-1,3,5,7-tetraazacyclooctane (HMX) [1]. As a result, a significant analytical problem is the detection of peroxide-based explosives (PBEs) in the field. Although many analytical techniques have been documented in the literature for the identification of PBEs, their spectroscopic [2,3] results do not directly apply to intact TATP and HMTD. Most analytical methods for PBEs are indirect and detect their decomposition product, H_2O_2. The glassy carbon electrode (GCE) that has been modified with multiwalled carbon nanotubes and polyethyleneimine (MWCNTs/PEI), named the GCE/MWCNTs/PEI, is used in this work to improve a voltammetric method for the direct detection of TATP and HMTD. The conducting PEI is being utilized as a modifier material (for working electrodes) for direct PBE sensing for the first time in this study. For method optimization, we tuned the solvent choice, scan rate, potential range, and supporting electrolyte concentration. Our sensor electrode has an evident advantage over similar literature methods as it responds to unspoiled TATP solutions in a neutral medium, which prevents TATP from interacting with acids or bases and turning it into H_2O_2. For TATP and HMTD, the calibration curves were linear between 10-200 mg L^{-1} and 25-200 mg L^{-1}, respectively. Utilizing DPV (Differential Pulse Voltammetry), we managed to detect 1.5 mg L^{-1} TATP and 3.0 mg L^{-1} HMTD from a direct electro-reduction in H_2O/acetone solvent solution (80/20 percent by volume). Our electrode exhibited non-responsive behavior to H_2O_2, which prevents "false positives" from other peroxide materials of daily use. We also demonstrated that our electrochemical sensor is capable of detecting different types of nitroaromatic explosive substances at different potentials and statistically verified it against chromatographic and CUPRAC techniques available in the literature. Furthermore, the suggested technique is unaffected by ordinary ions, other explosives, or electroactive disguise materials like passenger luggage (e.g., sweetener, detergent).

KEYWORDS: Peroxide-type Explosives, Differential Pulse Voltammetry, Polyethyleneimine, Multiwalled carbon nanotubes, Modified Electrodes.

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[PP85]

A NEW ELECTROCHEMICAL SENSOR FOR THE MEASUREMENT OF NITROGUANIDINE EMPLOYING A GLASSY CARBON ELECTRODE MODIFIED WITH POLYVINYLPYRROLIDONE AND MULTI-WALLED CARBON NANOTUBES

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The propellant family member nitroguanidine (NG) is a potent insensitive explosive in the form of a white crystal that resembles a stick or needle [1]. NG is utilized as a propellant in rockets, gas generators, smokeless fireworks, and regrettably also in terrorist activities in addition to the military sector. NG is easily released into the environment *via* sewage discharge or explosion remnants owing to its excellent aqueous solubility. These discharges are visible in places where ammunition is manufactured, and because soil microorganisms are unable to fully degrade it, it may enter groundwater and end up in human food. In this respect, researchers have made an effort to design several sensitive methodologies for assessing NG residues in environmental matrices, comprising spectroscopic and chromatographic determination methods [2]. Due to the thermal instability and strong polarity of these compounds, the majority of these procedures take a long time, are not particularly sensitive, and lack specificity. Electrochemical techniques are superior to these approaches because of their mobility, quick response time, excellent selectivity and sensitivity, but data for electrochemical determination of NG is very few in literature. In this work, a new electrochemical method of determination for nitroguanidine (NG) was performed by modifying the glassy carbon electrode (GCE) surface with a mixture of well-dispersed multi-walled carbon nanotubes (MWCNTs) and polyvinylpyrrolidone (PVP) used as a hydrogen-bonding substrate for the analyte. Electrochemical determination of NG was achieved in a concentration range of 3-100 mg L^{-1} by the proposed square wave voltammetric (SWV) method using the modified GC/PVP/MWCNTs electrode within a potential range from 0 V to -1.8 V in 0.5 mL acetonitrile + 4.5 mL phosphate buffer medium. The characteristic reduction peak potential of NG was obtained at about -1.32 V. NG was selectively determined in the presence of synthetic and real energetic material mixtures using the developed sensor electrode. Additionally, potentially interferent soil ions and electroactive camouflage materials (having similar appearance and color to explosives) did not interfere with the proposed SWV method, which was statistically validated against LC-MS using Student *t*- and *F*- tests [3].

KEYWORDS: Nitroguanidine determination, Multi-walled carbon nanotubes, Polyvinylpyrrolidone, Square wave voltammetry, Modified electrode.

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[PP86]

ELECTROCHEMICAL DETERMINATION OF ROSMARINIC ACID FROM *ORIGANUM MINUTIFLORUM* AND *ORIGANUM MICRANTHUM* EXTRACTS USING BORON-DOPED DIAMOND ELECTRODE

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Rosmarinic acid (RA) is the ester derived from caffeic acid known for its significant biological properties such as its HIV marker potential and role in blood clotting [1]. It also serves as a natural antioxidant, exhibiting antiseptic, antiviral, antibacterial, and anti-inflammatory properties [2]. RA has been identified as an important and prominent secondary metabolite found in certain plants and is also utilized in various sectors including medicine, cosmetics, and the food industry [3]. Analysis of medicinal plants is mainly important for evaluating the quality of a plant. For this reason, determining RA from plant extracts is valuable. In this study, it was aimed to analyze RA in ethyl acetate extracts obtained from the aerial parts of two Origanum species (*O. minutiflorum* and *O. micranthum*), which are endemic to our country, using electrochemical methods. Cyclic voltammetry and differential pulse voltammetry methods were used in various buffer solutions on boron-doped diamond electrode to investigate the electrochemical behavior of RA. A diffusion-controlled oxidation peak was obtained for RA by cyclic voltammetry. Optimum conditions were examined and it was observed that the most symmetrical and highest peak current value was obtained in phosphate buffer solution at pH 8.0 using boron-doped diamond electrode. As a result of the calibration study performed with differential pulse voltammetry, the linearity range and detection limit values were found to be 0.2-80 µM and 0.00851 µM, respectively. The developed method was successfully applied to the extracts for rapid, selective, sensitive, and precise determination of RA from collected plant extracts.

KEYWORDS: Boron-doped diamond electrode, determination, *origanum*, rosmarinic acid, voltammetry.

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[PP87]

THE EFFECT OF NITROAROMATIC AND NITRAMINE TYPE EXPLOSIVES ON THE DEVELOPED AMMONIUM DINITRAMIDE NANOSENSOR

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Ammonium dinitramide (ADN) is a solid rocket propellant containing ammonium cation and dinitramide anion in its structure. Since ADN does not contain halogen atoms such as ammonium perchlorate, it cannot emit halogen gas among its decomposition products. Thanks to this feature, ADN has begun to replace ammonium perchlorate [1]. Although ammonium dinitramide is a new generation environmental friendly rocket propellant that is increasingly used today, the methods that determine ADN are very few in literature. The aim of this work is to selectively and sensitively determine ADN using UV-visible spectroscopy in the presence of gold nanoparticles (AuNPs) [2]. When AuNPs functionalized with the selected reagent are reacted with dinitramide anion, aggregation of nanoparticles (accompanying a shift in surface plasmon resonance peak to longer wavelengths) occurs, which enables UV-visible spectroscopic determination of ADN [3]. Within the scope of the optimization studies, the time to centrifuge gold nanoparticles, the concentration and volume of the functionalizing reagent used, the time to modify the reagent with gold nanoparticles, the pH at which the reaction takes place, the selection of the buffer, and the reaction time were examined. With this sensor, ADN calibration was performed in the linear range of 0.1-1 ng L^{-1} with a limit of detection (LOD) of 0.013 ng L^{-1}. In performance measurement, examining the effects of nitramine, nitrate ester and nitroaromatic explosives on the sensor is important in terms of accurate analysis of real sample mixtures. In this regard, nitroaromatic and nitramine explosives were shown not to adversely affect the developed sensor. The analyte recovery was calculated by applying the developed sensor to binary synthetic explosive mixtures with ADN.

KEYWORDS: Rocket propellants, ammonium dinitramide, gold nanoparticles, molecular spectroscopic determination.

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[PP88]

EXAMINATION OF THE CHEMICAL COMPOSITION AND ANTI-DIABETIC ACTIVITIES OF *Abelmoschus esculentus, Peganum harmala,* AND *Aquilaria agallocha* SEED OILS CULTIVATED IN MUĞLA

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The prevalence of type 2 diabetes is rapidly increasing worldwide, including in our country. There is a consensus among researchers and relevant organizations that lifestyle and dietary factors play a role in the development of the disease. Numerous research data suggest that an increase in saturated and trans fats in the diet increases the risk of coronary heart disease and adversely affects glucose and insulin metabolism, thereby increasing the risk of type 2 diabetes [1].

Okra (*Abelmoschus esculentus* L. Moench) is a crucial vegetable plant. Okra is a popular plant recognized to have various health benefits, including anti-diabetic properties [2]. Regarding fatty acids, okra seed oil has been reported to be rich in palmitic, oleic, and linoleic acids [3]. Syrian rue (*Peganum harmala*) has been traditionally and commonly used for medicinal purposes since ancient times. *P. harmala* is reported to have hypoglycemic and cytoprotective effects [4]. Udi hindi (*Aquilaria agallocha*), an important medicinal plant, is one of the most commonly grown species in the Thymelaeaceae family. It is a rare plant on Earth due to its medicinal properties. The plant has various pharmacological activities such as antinociceptive, antimicrobial, laxative, antioxidant, sedative, anti-hyperglycemic, thrombolytic, anti-diabetic, ulcer protective, anti-cancer, anti-diarrheal, and hepatoprotective activities [5]. Every part of the plant possesses beneficial properties that can serve humanity. Researchers have investigated the anti-diabetic effect of methanol, water, and hexane leaf extracts of *A. agallocha* on streptozocin-induced diabetic rats. The findings suggest that *A. agallocha* leaves have promising potential as an anti-diabetic agent [6].

In this study, the fixed oils of *A. esculentus* L., *P. harmala* L., and *A. agallocha* Roxb. seeds, which were grown in different regions of Muğla province and collected during their maturation period and transported to the laboratory in sterile containers, were obtained using the cold pressing technique. The seed oils were analyzed using Gas Chromatography-Mass Spectrometry (GC-MSD) to determine their fatty acid compositions. Thirty-seven different fatty acids were screened, and it was determined that palmitic acid (C16:0), linoleic acid (C18:2), and oleic acid (C18:1 cis-9) were the major components in all three types. Additionally, the anti-diabetic activity analyses of the seed oils of the three species were conducted using the methods presented by Molo et al. in 2021 [7]. Promising results were obtained in terms of anti-diabetic activity for all three oils.

KEYWORDS: Anti-diabetic activities, fatty acid, *Abelmoschus esculentus*, *Peganum harmala*, *Aquilaria agallocha*.

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[PP89]

ELECTROCHEMICAL ANALYSIS OF MELATONIN ON POLY(BROMOCRESOL PURPLE) MODIFIED GLASSY CARBON ELECTRODE AND ITS DETERMINATION FROM PHARMACEUTICALS

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Melatonin (N-acetyl-5-methoxytryptamine) is a hormone synthesized from the pineal gland in the brain that regulates the circadian rhythm in the organism [1]. It has various effects such as showing antioxidant activity, modulating the immune response, and preventing of cancer [2]. The decrease in melatonin level below normal values in later ages leads to various sleep disorders. In these patients, melatonin treatment can improve sleep quality and regulate sleep/wake rhythm [3]. Therefore, it may be necessary to measure the level of melatonin in patients suffering from sleep disorders. In this study, a new electrochemical sensor was fabricated for the determination of melatonin on bromocresol purple (BCP) modified glassy carbon electrode (GCE). The electrochemical measurements were performed in buffer solutions by cyclic voltammetry (CV), differential pulse voltammetry (DPV), and square wave voltammetry (SWV). The poly(BCP) modified GCE showed a superior electrocatalytic effect towards melatonin than bare GCE. Under optimized analytical conditions, the linear ranges were obtained as 0.40–10 µM with low detection limits. The developed methods showed great sensitivity, selectivity, and reproducibility and were applied successfully for determination of melatonin from pharmaceutical samples.

KEYWORDS: Bromocresol purple, determination, glassy carbon electrode, melatonin, voltammetry.

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[PP90]

A SELF-POWERED ENZYMATIC GLUCOSE SENSOR USING BIMETALLIC NANOPARTICLES COMPOSITES MODIFIED PENCIL GRAPHITE ELECTRODES AS CATHODE

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Enzymatic biofuel cells (EBFCs) are very popular devices that can convert the chemical energy stored in the fuel directly into electricity using enzymes as biocatalysts [1]. In this process, the fuel is oxidized at the anode via enzymatic reactions and usually oxygen is reduced at the cathode. EBFCs are promising sources of green energy owing to the benefits of using renewable biofuels, eco-friendly biocatalysts, and moderate operating conditions [2]. In this study, we presented an EBFC that contains the composite anode and metal nanoparticle-based cathode. The anode was modified with multi-walled carbon nanotube (MWCNT) and ferrocene (Fc) as a conductive layer coupled with the enzyme glucose oxidase (GOx) as a sensitive detection layer for glucose. A chitosan layer was also applied on top of the electrode as a protective layer to complete the composite anode preparation. On the other hand, the cathode consisted of platinum and palladium metal nanoparticles (MNps), and their composites for oxygen reduction reaction because of their good conductivity and electron transfer rate. The system parameters were optimized, and the best results were obtained with the composite anode containing MWCNT (2.0 mg/mL), Fc (25 mM), GOx (20 mg/mL) modified glassy carbon electrode, and the cathode containing Pt-Pd (5.0 mM) nanoparticles modified pencil graphite electrode. The EBFC performance was investigated with potentiostat/galvanostat and EBFCs yield an open circuit voltage of 0.28 V and a maximum power density of 30.25 $\mu W\ cm^{-2}$. The results show that the proposed EBFC is a promising candidate for the detection of glucose while harvesting power in various samples containing glucose.

KEYWORDS: Enzymatic biofuel cell, self-powered glucose sensor, glucose oxidase, metal nanoparticles.

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[PP91]

PRODUCTION OF A ZnO-BASED SUPERCAPACITOR ELECTRODE MATERIAL RECOVERED FROM THE FERROCHROME ASH WASTE

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The primary objective of the energy storage research is to store energy efficiently and rapidly with a high capacity and to utilize the stored energy for an extended period of time. Supercapacitors, which are developed for all these purposes, stand out as a new technology with significant advantages including high power densities, long cycle numbers, and quick charge/discharge times, and are particularly used in portable electronic devices that require rapid and intense power transfer [1]. Since the high cost of production is the primary obstacle for the development of supercapacitors, manufacturing electrode materials from recycled industrial waste might reduce the cost while preventing the disposal of the waste to the environment. Ferrochrome ash (FCA) waste, which are generated during ferroalloy production, are a good candidate to produce supercapacitor electrode materials due to their high metal oxide content, considering the metal oxides are widely used electrode materials in the literature [2-3]. Additionally, disposal of FCA in landfills occupies a large amount of area and causes serious environmental damage. Furthermore, the fine-grained particulates of FCA disperse quickly by wind and threaten human health, necessitating the recycling of this waste from both an economic and environmental standpoint [4]. This study investigates the recovery of ZnO from FCA and the development of coin cell type asymmetric supercapacitors containing the electrodes produced from the recovered ZnO. In the present study, FCA was ball milled and washed with deionized water. Afterward, obtained dust was leached by the utilization of H_2SO_4 solutions with different concentrations, liquid : solid ratios and durations. The pH of the optimum leach solution was increased by the dropwise addition of 2.0 M NaOH solutions at room temperature to precipitate Zn^{2+} ions as $Zn(OH)_2$. The precipitates were calcined at 400 °C for 2 hours to obtain ZnO. Then, the produced ZnO was mixed with carbon black and PVDF. Prepared mixtures were applied on graphite foils with the doctor blade method to obtain the electrodes. Finally, the CR2032 coin cell supercapacitor was produced and characterized with Cyclic Voltammetry (CV), Galvanostatic Charge-Discharge (GCD), and Electrochemical Impedance Spectroscopy (EIS) analyses. The specific capacitance value of the coin cell was determined as 59 $mF.cm^{-2}$ at a scanning rate of 10 mV/s. Moreover, the supercapacitor provided an exceptional cycling stability after 1000 cycles.

KEYWORDS: Ferrochrome ash, supercapacitors, recycling, waste valorization.

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[PP92]

A NOVEL 1,10-PHENANTHROLINE-BASED DUAL-FUNCTIONAL ANTIOXIDANT CAPACITY SENSOR

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The situation that occurs when the balance between reactive oxygen species and antioxidants in the human body is disrupted in favor of reactive oxygen species is called oxidative stress. One of the best ways to combat diseases that occur in this situation is to consume foods rich in antioxidants. Therefore, it is important to determine antioxidant capacity selectively and sensitively. In general, antioxidant capacity methods can be divided into two main groups: hydrogen atom transfer (HAT) and electron transfer (ET) based. Spectrophotometric ET-based methods measure the ability of the antioxidant to reduce the oxidant by color change. There are many methods based on Fe(III)-Fe(II) reduction in the literature because they are easy and cheap. In this study, total antioxidant capacity determination from the combination of two different systems using the Fe(III)-1,10-phenanthroline (Fe(III)-phen) complex is presented. The first system is based on the reduction of Fe(III)-phen, a chromogenic oxidant, to colored Fe(II)-phen in the presence of antioxidants. In the second system, this complex, which has oxidase-like activity, oxidizes 3,3′,5,5′-tetramethylbenzidine (TMB) without hydrogen peroxide. Fe(III)-phen could directly catalyze TMB to induce blue chromogenic changes without H_2O_2 [2]. Antioxidants can scavenge the blue-colored oxidized TMB, causing a decrease in absorbance at 652 nm. Application conditions were optimized for two Fe(III)-phen based methods and calibration graphs of some antioxidants were obtained. The developed dual-sensor system has the potential to be a good alternative to dual-sensor-based TAC determinations, which are quite limited in the literature.

KEYWORDS: Antioxidants, dual-sensor, ferric-phenantroline, spectrophotometry, total antioxidant capacity.

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[PP93]

A NEW COLORIMETRIC LACTATE BIOSENSOR BASED ON CUPRAC (CUPric Reducing Antioxidant Capacity) REAGENT USING LACTATE OXIDASE- PYRUVATE OXIDASE IMMOBILIZED MAGNETITE NANOPARTICLE

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Lactate is produced in most human body tissues, such as the brain, erythrocytes, skeletal muscle, and kidneys. Lactate is used as a biomarker to evaluate human health, which has made it an important molecule for the design of both enzymatic and non-enzymatic biosensors [1]. Copper(II)-bis neocuproine chelate ($[Cu(Nc)_2]^{2+}$) known as the cupric reducing antioxidant capacity (CUPRAC) reagent, was developed by Apak and co-workers in 2004 to determine the total antioxidant capacity of phenolic compounds [2]. Copper(II)-bis neocuproine complex, a chromogenic oxidizing agent, is reduced due to a redox reaction with antioxidants (reductant compounds). At the end of this reaction, absorbance is recorded at 450 nm, where the $[Cu(Nc)_2]^+$ complex gives maximum absorbance. This study describes an optical lactate biosensor based on a colorimetric reaction between enzymatically produced H_2O_2 and $[Cu(Nc)_2]^{2+}$. An enzymatic reaction takes place between lactate with lactate oxidase (LOx) and pyruvate oxidase (POx) bi-enzymatic system immobilized on silanized magnetite nanoparticles ($SiO_2@Fe_3O_4$ NPs). A total of 2 moles of H_2O_2 were released per 1 mole of lactate by using the binary enzyme (LOx+POx). Biosensor optimization studies were performed in the solution media using a free enzyme (without immobilization), and the volume of the enzyme, enzymatic reaction time, pH, and temperature were optimized. Then, absorbance and spectra of $[Cu(Nc)_2]^+$ were recorded at 450 nm based on the increasing concentration of lactate under optimized conditions. Results show that when using only $LOx@CS@SiO_2@Fe_3O_4$ NPs the linear range obtained from the calibration curve is between 1.0 and 100.0 μM with the equation A= 0.0118C (μM) + 0.0743 and the LOD value was estimated as 0.37 μM. The linear working range and LOD value for the binary enzyme ($LOx\text{-}POx@CS@SiO_2@Fe_3O_4$ NPs) were recorded as 0.5-50 μM and 0.17 μM respectively, and the linear equation was found to be A= 0.0186C(μM) + 0.0053. These values show that the sensitivity is enhanced twice compared to using only LOx. The %RSD value obtained from three different calibration curves was 3.7% for $LOx@CS@SiO_2@Fe_3O_4$ NPs and 4.0% for $LOx\text{-}POx@CS@SiO_2@Fe_3O_4$ NPs. The selectivity property of the proposed optical biosensor was tested on possible interfering molecules (some monosaccharides, ascorbic acid, uric acid, and dopamine). In the last step, an optical lactate sensor was successfully applied to the milk sample with the recovery method. As a result, a sensitive and repeatable optical lactate biosensor was constructed based on CUPRAC reagent and binary enzyme immobilized magnetite nanoparticles.

KEYWORDS: CUPRAC, magnetite nanoparticles, colourimetric biosensors, lactate oxidase, pyruvate oxidase.

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[PP94]

DETERMINATION OF TOTAL ANTIOXIDANT CAPACITY USING MODIFIED ELECTRODE

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Reactive oxygen species, which are the natural result of metabolism in an oxygen-containing atmosphere, are highly toxic in excess. High doses of ROS lead to unlimited oxidation of DNA, proteins and lipids and cellular damage occurs. One of the best ways to get rid of these harmful effects is to balance ROS with antioxidant compounds. Therefore, the importance of determining total antioxidant capacity has been increased [1]. Within the scope of this study, it was aimed to develop an amperometric total antioxidant capacity determination sensor by preparing a modified electrode based on the Cupric Reducing Antioxidant Capacity (CUPRAC) method. First of all, the glassy carbon electrode surface was modified with multi-walled carbon nanotube composited with negatively charged biomaterial. Afterwards, the sensor electrode was obtained by adding CUPRAC reagent to this negatively charged electrode surface. Cyclic voltammetric studies showed that the modified electrode exhibited a well-formed reversible redox couple for the Cu(II)-/Cu(I)-complex. Amperometric current behavior was examined with the addition of antioxidants under constant potential with the sensor electrode immersed in a buffered solution medium. A number of antioxidants were tested by the proposed amperometric sensor so as to compare their trolox equivalent antioxidant capacities with those found by the conventional CUPRAC method. The proposed sensor was applied to measure the TAC values of synthetic mixtures and real sample matrixes.

KEYWORDS: Amperometry, antioxidant, biomaterial, CUPRAC, electrochemical sensor, negatively charged.

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[PP95]

DEVELOPMENT OF HYDROGEL-BASED COLORIMETRIC ANTIOXIDANT CAPACITY SENSOR

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Under the conditions of 'oxidative stress', which occurs when the accumulation of reactive oxygen species (ROS) is not balanced with the antioxidants present in the organism or taken with food, radical chain reactions that can cause oxidative damage to biological structures such as DNA and cell membranes occur and serious diseases occur [1]. The best way to fight diseases caused by reactive oxygen species is to balance the level of reactive oxygen species by consuming foods rich in antioxidants. Antioxidants are substances that can inhibit or delay oxidation. Although there are many methods in the literature to determine the antioxidant capacity/activity of food extracts, research studies on colorimetric sensor-based determination methods are quite limited. The main aim of this study is to develop an optical sensor based on natural hydrogel, which can be used at low cost and widely used for the measurement of antioxidant capacity in food extracts, based on the CUPRAC method. Alginate was chosen because of its favorable properties as a support material in the preparation of low-cost hydrogel. Alginate are naturally occurring anionic polymer typically derived from seaweed and stands out for its biocompatibility, low toxicity, and low cost. The basis of the method is to measure the color change due to the yellow-orange Cu(I)-Nc chelate formed as a result of the reaction of the reactive Cu(II)-Nc complex electrostatically held in the low-cost hydrogel film with antioxidants. Working conditions of the colorimetric sensor were optimized and calibration curves of some antioxidant standards were obtained. The outputs from this study have the potential to enable the development of similar colorimetric sensors in the future.

KEYWORDS: Antioxidant capacity, cupric complex, food extracts, spectrophotometry, fluorometry.

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[PP96]

Cu(II)Nc/Car-MWCNT MODIFIED ELECTRODE FOR ANTIOXIDANT CAPACITY MEASUREMENT

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Reactive oxygen species (ROS) are oxygen-containing chemical compounds that are formed as a by-product of normal metabolic processes in cells and organisms. ROS can cause cell damage under oxidative stress conditions. Oxidative stress can lead to damage of biomolecules such as DNA, proteins and cell membranes and can cause to various health problems. It is important to consume foods rich in antioxidants to prevent reactive oxygen species from damaging cells [1]. The produced electrode has been called copper(II)-neocuproin/carrageenan-multi-walled nanotube/glassy carbon electrode (Cu(II)Nc/Car-MWCNT/GCE). The modified electrode shows a highly well-formed reversible redox pair for the Cu(II)-Nc/Cu(I)-Nc complex, according to cyclic voltammetric tests. The anionic groups of the carrageenan on the electrode engage electrostatically with Cu(II)-Nc to immobilize to the surface. Then, under continuous potential and the addition of an antioxidant, Cu(II)-Nc on the surface is decreased. Calibration curves of several antioxidants were constructed using the proposed sensor. Standard antioxidants were spiked to the tea samples and determined by the proposed sensor. An interference studies was performed, as well as measurements on real samples. As a result, a sensitive, inexpensive, fast, simple and portable analysis sensor has been presented to the literature.

KEYWORDS: Electrochemical sensor, CUPRAC, multiwall carbon nanotube, oxidative stress, total antioxidant capacity.

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[PP97]

SMART AND SENSITIVE NANOMATERIAL-BASED ELECTROCHEMICAL SENSOR FOR THE DETERMINATION OF A POLY (ADP-RIBOSE) POLYMERASE (PARP) INHIBITOR ANTICANCER AGENT

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With rising mortality rates, cancer, which is characterized by unchecked cellular proliferation, continues to pose a serious threat to world health [1-4]. The need for novel therapeutic approaches is still urgent despite significant breakthroughs in cancer treatment over the past 50 years [5]. Talazoparib has emerged as a promising candidate among cutting-edge therapeutic approaches for the treatment of metastatic breast cancer [6]. Its strong PARP-trapping impact at DNA damage sites underpins its extraordinary potency [7]. Due to its improved capacity to trap PARP on DNA and ensuing increased cytotoxicity, Talazoparib outperforms other PARP inhibitors in terms of effectiveness [8]. Thus, to undertake reliable and precise determination of these compounds, particularly sensitive analytical techniques are required. In our study, using high-quality multi-walled carbon nanotubes functionalized with amino groups (MWCNT-NH_2), we propose a novel method for developing an electrochemical sensor that is sensitive and selective for the detection of Talazoparib (TLZ), an inhibitor of the poly (ADP-ribose) polymerase (PARP) enzyme, in actual samples. The MWCNT-NH_2-based sensor demonstrated outstanding performance traits, such as strong selectivity against a variety of interferences and exceptional repeatability and reproducibility. The sensor showed a broad linear concentration range of 1.0-5.0 µM with a low limit of detection (LOD) of 0.201 µM while operating under ideal conditions. Our methodology stands out as a model of reliability when supported by a careful examination of pharmaceutical and biological matrices, with recovery rates that fall within the desirable range of 96.38–105.25 percent. The MWCNT-NH_2-based sensor's performance in practical sample analysis demonstrates its potential for use in medical and pharmaceutical settings. This study opens new doors for the creation and oversight of cutting-edge anticancer therapies in addition to advancing the electrochemical sensing use of MWCNT-NH_2. The conclusions drawn from our study have broad

ramifications and hint at a time when accuracy and creativity will combine to enhance patient care and therapeutic results.

KEYWORDS: Talazoparib, electrochemical sensor, multi-walled carbon nanotubes, sensitivity, selectivity, pharmaceutical analysis, anticancer medication.

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[PP98]

ELECTROCHEMICAL DETERMINATION OF HYDROXYCHLOROQUINE USED IN COVID-19 TREATMENT USING MULTIWALL CARBON NANOTUBE MODIFIED PENCIL GRAPHITE ELECTRODE

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Chloroquine and hydroxychloroquine are among the drugs recommended in the first place in the treatment of coronavirus diseases (Coronavirus Infectious Diseases 2019, COVID-19) [1]. Therefore, its sensitive, practical, and fast determination is important in many areas. Electrochemical detection is widely considered one of the most effective methods of determining a substance through its electrocatalytic oxidation or reduction at a range of electrodes. [2]. This study found that, the electrochemical behaviour of hydroxychloroquine (HCQ) was investigated using a multiwall carbon nanotube-modified pencil graphite electrode (MWCNT-PGE). A novel disposable, selective, inexpensive, and, sensitive electrochemical HCQ sensor based on MWCNT-PGE is proposed. The cyclic and differential pulse voltammograms were recorded to investigate the electrochemical behaviour of HCQ. Cyclic voltammograms of HCQ were recorded in BRBS solutions containing 0.1 M KCl at pH values ranging from 2.0 to 12.0 and a scan rate of 50 mVs^{-1} to investigate the effect of pH on potential and peak currents. Cyclic voltammograms of 0.01 mM HCQ at different scan rates were recorded to determine the effect of scan rate on peak potentials and currents. The results, supported by the observed linear increase in peak currents based on the square root of the scan rate, suggest that HCQ oxidation at MWCNT-PGE occurs via a diffusion-controlled process. Analytical performance was performed by monitoring differential pulse voltammograms of HCQ in pH 10.0 BRBS using MWCNT-PGE with optimal parameters of pulse amplitude (140 mV), pulse time (3 ms), scan rate (50 mV/s), and step potential (5 mV). The calibration curves were obtained from two different oxidation peaks depending on HCQ concentration. Linear calibration curves were obtained for both oxidation peaks within the range of concentrations between 0.1 μM and 200 μM with equations of $I(\mu A) = 2.611C(\mu M) - 0.0544$ $R^2 = 0.9974$ and $I(\mu A) = 2.382C(\mu M) - 0.8553$ $R^2 = 0.9968$. The detection limits were determined as 0.033 μM and 0.037 μM for the first and second oxidation peaks of HCQ, respectively.

KEYWORDS: Hydroxychloroquine, electrochemical sensors, cyclic voltammetry, amperometric detection, pencil graphite electrode

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[PP99]

EVALUATION OF ALTERNATIVE WAYS TO ANALYSE IODINE VALUES OF FATS AND OILS WITHOUT USING CARBON TETRACHLORIDE

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The main purpose of iodine value analysis is to find the saturation ratio of fats, oils and waxes in lubrication industry. There are standard test methodologies to determine the iodine value of fats, oils and waxes. ASTM D5554 and IP 84 are the most common standard test methods. Despite the success of these test methodologies usage of harmful chemicals like carbon tetrachloride is one of the restrictions of these application. Usage of carbon tetrachloride has been restricted because of the harmful effects on nature and human health. In this study, we have been evaluated the usage of alternative chemicals like: petroleum benzoil, acetone, ethanol, kerosene, n-hegzane, toluene, cyclohexane, and different types of mid chain oils. Effects of solvent type and sample weight on analysis results have been investigated an reported. Repeatability and reproducibility of the application have been examined and reported. Comparison results of new approach with IP 84 and ASTM D5554 have been evaluated and reported.

KEYWORDS: carbon tetrachloride, fats, oils, iodine index, IP 84, ASTM D5554.

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[PP100]

SALTING-OUT HOMOGENOUS LIQUID-PHASE MICROEXTRACTION FOR RAPID ON-SITE EXTRACTION OF AROMATIC AMINES IN ENVIRONMENTAL WATERS

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On-site sample preparation is an analytical process that allows samples to be prepared in the field without the use of today's common practices such as storage and transport [1,2]. In this study, a new salting-out homogenous liquid-phase microextraction approach has been developed for rapid on-site extraction of aromatic amines in environmental waters. Di-(2-ethylhexyl)phosphoric acid (DEHPA) was used as the extraction solvent. The extraction process was carried out in a plastic syringe without the need for any electrical equipment. The process was based on dissolving DEHPA in an alkaline medium leading to the formation of a homogeneous solution, followed by salting-out precipitation of the sodium salt of DEHPA and filtering the resulting precipitate using a syringe filter. The precipitate containing the analytes was dissolved in methanol, and then analyzed by high-performance liquid chromatography-ultraviolet detection (HPLC-UV). The important parameters affecting the extraction efficiency were examined and optimized. Under optimal conditions, the extraction recoveries for aromatic amines were between 26 and 71%. Linearity was observed in the range of 1.0–100 µg/L, with the square of correlation coefficients (r^2) higher than 0.9987. The method detection limits for aromatic amines were in the range of 0.28–0.41 µg/L. The values for intra-day and inter-day precisions were lower than 9.5% and 10.8%, respectively. The method was finally applied to the determination of aromatic amines in real environmental waters and acceptable recoveries in the range of 80–109% were obtained for spiked tap, rain and stream waters. Moreover, the method was also applied in the field for on-site extraction of target pollutants, and no statistically significant differences were observed with the results obtained from laboratory applications.

KEYWORDS: Aromatic amines, homogenous liquid-phase microextraction, on-site sample preparation, environmental waters.

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[PP101]

REMOVAL OF BISPHENOL ANALOGUES FORM THE AQUATIC ENVIRONMENT BY FRESHWATER MICROALGAE *CHLORELLA VULGARIS*

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Bisphenol A (BPA) is one of the highest production volume chemicals, used as an additive or monomer in the production of epoxy resins, polycarbonate plastics, and thermal paper in a wide range of consumer products. The potential toxicity and estrogenic activity of BPA, as well as its progressive restriction and banning of BPA in the production of many commercial applications, have led to its substitution with analogues that have similar physicochemical properties and negative effects. Literature reports show that freshwater microalgae are able to biodegrade contaminants, such as BPA and its analogues and consequently can reduce their concentration in the aquatic environment [1, 2].

The purpose of this work is to study the removal of BPA and its analogues from aquatic environment by freshwater microalgae. The experiment was performed using cultures of *Chlorella vulgaris* (BA-2) acquired from the Culture Collection of Baltic Algae at the Institute of Oceanography of University of Gdansk. Exponentially growing strains were exposed to 0.5 mg L^{-1} mixture of bisphenol A, bisphenol AF, bisphenol B, bisphenol E and bisphenol Z for 7 days. Biomass at the beginning of the experiment were 0.739 mg mL^{-1}. Concentrations of the tested compounds in the control sample (the amount of abiotic removal) and in the test sample (the amount of biotic removal: residual amount in the medium, amount adsorbed on cells and accumulated in cells) were determined at 0, 1, 2, 3, 4 and 7 days of experiment using a high-performance liquid chromatography system equipped with a diode array detector or a fluorescence detector (Agilent Technologies, USA).

The results showed that the concentrations of the tested compounds incubated in the presence of the green algae *Chlorella vulgaris* decrease during 7 days of incubation. Therefore, freshwater microalgae can be successfully used to remove these pollutants from the aquatic environment.

KEYWORDS: High performance liquid chromatography, bisphenol A, bisphenol analogues, green algae, biodegradation.

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[PP102]

REMOVAL OF SELECTED BISPHENOL ANALOGUES BY GREEN ALGAE *DESMODESMUS ARMATUS*

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In recent years, the use of bisphenol A in the manufacture of many consumer products such as toys, plastic bottles, and plastic containers has received worldwide public concern due to its effects as an endocrine disrupting compound. As a result, a variety of bisphenol analogues have been produced as alternatives for this xenoestrogen in daily use products. Unfortunately, these analogs are not safe alternatives and may exhibit similar toxicity and estrogenic effects as BPA. Due to the ubiquity of these compounds in the aquatic environment, it is necessary to find new methods for its treatment [1, 2].

The aim of this work was to estimate the efficiency of removal bisphenol A and its selected analogues by green algae. *Desmodesmus armatus* (BA-6) were purchased from the Culture Collection of Baltic Algae (Institute of Oceanography, University of Gdansk, Poland). Green algae cultures were cultivated in the presence of 0.5 mg L^{-1} mixture of bisphenol A and its four analogues (bisphenol AF, bisphenol B, bisphenol E and bisphenol Z). The algal cells were cultured in the phytotron chamber in the photoperiod in the day/night cycle 14/10 h, temperature 26/21°C with a constant humidity of 30% under white light (60 µmol photons m^{-2} s^{-1}). The initial biomass content was 0.743 mg mL^{-1}. At 0, 1, 2, 3, 4 and 7 days of experiment, the residual, adsorbed and accumulated concentrations in the test sample (with green algae) and the residual concentration of the tested compounds in the control sample (without green algae) were measured. Analysis was carried out by high-performance liquid chromatography equipped with a diode array detector or a fluorescence detector (Agilent Technologies, USA) using an ACE Equivalence 5 C18 column (4.6 ×100 mm, 5µm).

The results of this study suggest that the green algae *Desmodesmus armatus* shows a high capacity to remove bisphenol A and its selected analogues and can be used to treat aquatic environments contaminated with these compounds.

KEYWORDS: High performance liquid chromatography, bisphenol A, bisphenol analogues, green algae, biodegradation.

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[PP104]

SYNTHESIS OF AN IMPRINTED POLYMER FOR SEPARATION AND COLORIMETRIC DETERMINATION OF HYPOXANTHINE IN FISH SAMPLES AS A FRESHNESS INDICATOR

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One of the main indicators showing the freshness of fish is undoubtedly the amount of hypoxanthine (Hx). HX imprinted polymer was synthesized to the separation of HX from fish samples. Then, the new adsorbent has been characterized using SEM and FTIR spectroscopy. The optimization of parameters such as pH and time were optimized. The optimized pH is 6 and the optimum adsorption time is 240 s also various interference ions' effects were investigated. Results showed that the newly synthesized adsorbent is very selective and efficient for the extraction and determination of HX. The method's ability to determine HX without interference from nearly all other biochemical compounds present in biological fluids is a noteworthy advantage. Then HX was oxidized on the surface of the synthesized polymer by xanthine oxidase (XOD). Uric acid (UA) and H_2O_2 are enzymatically produced, and both products respond to the ferroin reagent to produce the red color formed in situ on the imprinted polymer. For quantitative analysis, ferroin was dissolved in acetonitrile and measured at 509 nm. Hx was measured at different time intervals in the fish samples. It was observed that there was a linear increase in the amount of Hx during the measurement period. The method was verified with analysis and standard additions to real samples, and validated against HPLC. The proposed method was demonstrated to have distinct superiority over many recent colorimetric sensors of fish freshness in regard to its good selectivity for Hx, and capability to cope with interferents (including biologically important antioxidants, such as cysteine, reduced glutathione, ascorbic acid, and UA and applicability to real samples.

KEYWORDS: Hypoxanthine, imprinted polymers, biosensor, fish, freshness.

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[PP107]

SORPTION OF VITAMIN C ONTO MICROPLASTICS

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Micro- and nanoplastics as the carrier of various substances such as metals, pharmaceuticals, and other organic contaminants etc. have been concerned in environments and human health. However, interaction of vitamins with micro- and nanoplastics are still uninvestigated. Therefore, the aim of this study was to evaluate the sorption properties of vitamin C (ascorbic acid) onto micro- and nanoplastics obtained from different food packages. Here, the sorption of vitamin C (ascorbic acid) onto micro- and nanoplastics in the various pHs (4.5, 7.0 and 9.0) was studied using batch technique, also sorption kinetic and isotherm models were investigated. After the exposure with micro- and nanoplastics in various time intervals, vitamin C determined using LC-MS-MS. The obtained results showed that sorption was achieved at 1440 min for acidic condition, and 960 min for notral and alkali conditions. The results also indicated that approx. 40-90% sorption capacities were obtained between 500-2500 ppb. Sorption kinetics and isotherms models were applied using pseudo-first order and second-order models, and Freundlich and Langmuir linear sorption models were used to fit the sorption isotherms.

KEYWORDS: Ascorbic acid, sorption, nanoplastics, food, microplastics.

[PP108]

IMPACT OF THE *IN VITRO* HUMAN DIGESTIVE ENVIRONMENT ON THE INTERACTION BETWEEN VITAMIN C AND MICROPLASTICS

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Microplastics has been interacting with various substances such as metals, pharmaceuticals, and other organic contaminants etc., thus the interaction between microplastics and any substances has been of high importance for human health. However, interaction of vitamins with microplastics under *in vitro* conditions are still underestimated. Vitamin C concentration is an important parameter to evaluate food composition, due to the ever-increasing demand for safe and quality food worldwide. Therefore, the aim of this study was to evaluate the interaction of vitamin C (ascorbic acid) with microplastics obtained from food packages under various *in vitro* digestive systems like intestinal and gastric. Here, sorption responses (e.g., sorption capacity, equilibrium time) were examined using batch technique by LC-MS-MS, also sorption kinetic and isotherm models were applied. The results showed that the sorption was achieved in 180 min and 45 min for gastric and intestinal conditions, and vitamin C absorbed at the level between 3-20% onto microplastics under *in vitro* digestive conditions.

KEYWORDS: Ascorbic acid, sorption, digestion models, *in vitro*.

[PP109]

REMOVAL OF TEXTILE DYE FROM WASTEWATER WITH GREEN CHEMISTRY ASPECT

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Some industries such as printing, textile, leather, cosmetics, dye and pigment manufacturing give rise to millions of tons of colored wastewater every year. The textile industry is the most prominent among sources of such pollutants [1,2]. Evidence shows that dye-contaminated wastewater is dangerous for the environment and especially harmful for humans. Therefore, dye removal from wastewater is of paramount importance [3] and is generally achieved by a combination of physico-chemical and/or biological methods. Various powerful chemical dye removal methods are available but not generally preferred due to their use of hazardous chemicals [4]. Therefore, the development of more environmentally friendly chemical approaches rooted in the principles of Green Chemistry is required. In this study, Deep eutectic solvents (DES) [5] were tested as a sustainable method for removal of dye from textile wastewater. Samples were measured by UV spectrophotometry at 542 nm for reactive red 3BX (Meghmani Dyes and Intermediates Ltd.). Deep eutectic solvent type and volume, dispersive solvent type and volume, dye concentration, pH and salt effect were optimized as experimental parameters. Data ranges included pH values of between 2–10, salt concentrations of 0.1–1 M, and dye concentrations between 1 and 20000 ppm. All parameters were optimized by 100 ppm dye concentration and 5 mL of model solution. Removal efficiency percentage reached 99% with a choline chloride:phenol molar ratio of 1:3.

KEYWORDS: Textile dye removal, Deep Eutectic Solvents (DES), UV-VIS spectrophotometer, Green Chemistry.

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[PP110]

EFFECT OF POMEGRANATE SEED PEELS AS ADSORBENT FOR THE REMOVAL OF DYES FROM AQUEOUS SOLUTION

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Water is a natural resource that is vital for living things. The development of industry, increase in population and urbanization have led to some environmental problems. One of these problems is water pollution. As a result of some activities of the industry, extremely harmful chemical wastes appear in the water. Dyes, many of which are toxic, are one of these wastes. It has been observed that the textile sector accounts for almost half of the existing dye waste [1]. Dyes are dangerous due to some chemical components they contain and their non-biodegradability. They need to be removed from waters because they cause environmental and health problems. For this reason, it is important to conduct research and develop various methods for removing dyes from water [2]. Adsorption is one of the preferred methods in wastewater treatment. It is highly efficient, easy to apply and environmentally friendly.

Adsorption is an equilibrium separation process in which molecules accumulate at the interface of two similar or different phases. Alternative natural adsorbents can be chosen to make the process less costly [3]. Natural adsorbents can generally be evaluated from agricultural wastes. Thus, they are recycled for the environment. They are also easily accessible and economical. In this adsorption study, pomegranate seed peels were used as adsorbent. For the adsorbate, neutral red, a water-soluble, synthetic dye, was preferred. Various parameters of the adsorbent-adsorbate relationship were investigated in the experiments. Kinetic, thermodynamic and isotherm data were evaluated. Accordingly, it has been observed that pomegranate seed peel is promising as an alternative adsorbent for dye removal in aqueous medium.

KEYWORDS: Neutral red, Pomegranate seed peel, Adsorption, Wastewater.

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[PP111]

IMPACT OF Ni(II) ON GROWTH, METAL UPTAKE, AND LIPID UNSATURATION OF TWO MICROALGAL SPECIES

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Microalgae species, such as Chlorella sorokiniana and Chlamydomonas reinhardtii, are widely used as model organisms for studying fundamental biological processes, including photosynthesis, lipid metabolism, and stress responses.[1,2] These species hold significant importance in various scientific disciplines, as they are widely recognized for their potential in diverse applications, ranging from biofuel production to wastewater treatment and heavy metal bioremediation.[3] By investigating their growth and responses to environmental factors, valuable insights into their metabolism, and therefore information for optimal cultivation conditions for each application, can be gained.[4]

In this study, C.sorokiniana and C.reinhardtii were cultivated in the presence of Ni(II) (1.0-6.0 ppm), to investigate the impact of this metal on the growth and specific physiological responses of these microalgae. During the incubation with Ni(II) significant effects were noted not only in terms of the biochemical metabolomic behaviour changes in the algal cells, but also significant changes in the systems' chemistry, mainly the speciation of some of the metals present in the growth media. A positive correlation was observed between the Ni(II) incubation concentration and the determined Ni uptake by each algal species. Besides Ni accumulation, an increasing uptake of metals present in the growth medium was also observed as a function of higher Ni(II) incubation concentrations. These metals are present in the TAP growth medium, as being necessary for cell growth. This observation was possible as the analysis was conducted using a multielement ICP-MS detector for metal monitoring, and would have possibly been neglected if a single element detector was used (e.g. AAS). Theoretical speciation calculations revealed that a major effect of Ni addition to the growth media was the release of other metal nutrients from their EDTA complexes and the complexation of Ni with EDTA.

In addition, lipid unsaturation levels were investigated by ^{1}H NMR analysis. Lipid unsaturation levels remained unaffected in C.sorokiniana for all incubation conditions, but a rather significant decrease was observed for C.reinhardtii. Reverse-phase liquid chromatography coupled with a triple quadrupole mass spectrometer (RPLC-MS/MS) operating in the multiple reaction monitoring mode enabled the study of C.reinhardtii major lipid groups (i.e., MGDG, DGDG, and SQDG) and the effect of Ni(II) incubation concentration on their saturation level.

KEYWORDS: Photosynthetic microalgae, metal uptake, metal speciation, ICP-MS, lipid unsaturation.

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[PP112]

REMOVAL OF METHYLENE BLUE DYE USING POLY(ACRYLAMIDE) GRAFTED ONTO CROSS-LINKED POLY(4-VINYL PYRIDINE) FROM WATERS

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Removal of dye from waters has become an important problem in both aspects health and environmental issues in recent years. Dyes are toxic thus their removal from the industrial effluents is vital. In this study, poly(acrylamide) grafted onto cross-linked poly(4-vinyl pyridine) (P4-VP-g-PAm) was synthesized and used for the removal of cationic dye methylene blue (MB) from the aqueous solutions. The concentration of the MB was determined colourimetrically using Jenway 6105 UV/VIS Spectrophotometer (UK) at λmax= 665 nm. The characterization of the polymer was carried out using several analytical techniques namely scanning electron microscopy–energy dispersive X–ray spectroscopy (SEM/EDX), thermo gravimetric analysis (TGA), Brunauer–Emmett–Teller (BET) surface area analysis and zeta potential. The adsorption of MB dye was studied by examining various parameters and the optimum conditions were determined (pH: 12.0, adsorbent dosage: 50.0 mg and contact time: 50.0 min.). The sorption capacity was found to be 331 mg L^{-1}. Moreover, various isotherm and kinetic models were used to elucidate the mechanism of sorption. It was observed that the adsorption process followed the Langmuir isotherm and the pseudo-second order kinetic model. In the spike recovery studies conducted with real water samples, recoveries of over 79% were obtained. As a result, it has been shown that synthesized polymer is an effective and powerful sorbent in the removal of MB from aqueous solutions.

KEYWORDS: Methylene blue, polymer, removal.

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[PP113]

SYNTHESIS AND USE OF MAGNETIC AMBERLITE XAD-7HP FOR THE REMOVAL OF METHYLENE BLUE FROM AQUEOUS SOLUTIONS

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Dyes are known to belong to the significant class of pollutants [1]. The contamination of water by dyes poses serious health problems. Therefore, efficient treatment methods are required for their removal. Methylene Blue (MB), a cationic dye, has a widespread application in textile dyeing and it has been present in human and veterinary pharmacopoeias for a long time [2]. This work describes a reliable strategy for the effective removal of MB using chemically modified magnetic Amberlite XAD-7HP. The structural properties of the adsorbent were examined by scanning electron microscopy, elemental, zeta potential and thermal gravimetric analyses. The concentration of the MB was determined colorimetrically using UV/VIS Spectrophotometry. The influence of pH, adsorbent amount, contact time, and temperature on the adsorption properties of MB onto the adsorbent was investigated. The maximal removal efficiency and experimental adsorption capacity under these circumstances were evaluated. The adsorption process was found to be in good agreement with the pseudo-second-order kinetic and Langmuir isotherm models. Based on the analysis of thermodynamic parameters, it was inferred that the adsorption process was exothermic and spontaneous. The performance of the adsorbent was examined using real water samples (industrial waste water, bottled drinking water, tap water, and ultrapure water) and confirmed the applicability of the adsorbent for practical applications for MB removal.

KEYWORDS: Adsorption, magnetic, Amberlite XAD-7HP, methylene blue, water.

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[PP114]

ASSESSMENT OF WATER QUALITY PARAMETERS: A COMPARATIVE STUDY BETWEEN COMMERCIALLY AVAILABLE KIT AND IN-HOUSE ANALYSIS

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Aquatic ecosystems are suffering biodiversity loss, becoming recipients and conduits for anthropogenic pollution [1], [2]. Cost-effective methods for detecting physicochemical properties in environmental waters is revolutionizing water quality assessment, enabling widespread application and timely response to potential hazards [3], [4]. Thus, there is an urgent need to develop low-cost methodology for effective water quality assay. This study presents a comprehensive comparative analysis of three crucial water quality parameters (especially for sewage and environmental water samples) - Chemical Oxygen Demand (COD), Total Nitrogen (TN), and Total Phosphorus (TP) - employing two distinct measurement methodologies. The first method utilized a commercially available kit, while the second method involved an in-house developed photometric procedure. This research sought to validate both techniques, providing valuable insights for environmental monitoring and assessment. Furthermore, the study investigated potential influencing factors, such as sample matrix variations (WWTP effluent and surface water) and concentration ranges, shedding light on the applicability and limitations of each method under different conditions. The two methods demonstrated similar properties for the TP and COD determination, however, TN in-house method showed low accuracy. Overall, the in-house methods exhibited notably higher measurement ranges and lower detection limits across all three parameters. These findings offer valuable guidance for researchers and practitioners in selecting the most suitable methodology based on specific research objectives and resource constraints.

KEYWORDS: Water quality assessment, method development, COD, total phosphorus, total nitrogen.

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[PP115]

THE EFFECT OF SEASONAL CHANGES ON THE PHYTOCHEMICAL ANALYSIS OF DOMINANT MACROALGAL SPECIES AT THE MARMARA SEA

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There is a growing global interest for natural products free of additives natural antioxidants like tocopherols, ascorbic acid, carotenoids, flavonoids, amino acids, and phospholipids are used to prevent or delay oxidation, particularly in food and cosmetic products. Macroalgae, crucial biological resources found in coastal marine ecosystems and major component of the food chain, are considered as valuable biomass in various industries, including cosmetics, food production, agriculture, and medicine regarding their secondary metabolites. The seasonal variations in the biochemical characteristics of macroalgae subsequently impact their ecological and economic significance [1]. The purpose of this study was to evaluate and compare seasonal variations of total antioxidant capacity (TAC) (CERAC, CUPRAC and ABTS/TEAC), total phenolic (Folin-Ciocalteu) (TPC) and total flavonoid contents (TFC) [2] of different macroalgae species. The sampling was carried out seasonally from the seashore in Florya (site 1) and Sarıyer (site 2) districts from July 2022 to May 2023. The physical parameters measured at the stations changed in parallel with the seasonal changes. The nutrient concentrations were measured at lower levels at the sampling sites and chlorophyll-a values ranged between 0.32-0.85 µg/L. Water quality measurements made simultaneously with heavy metal measurements also provided information about the trophic levels of the stations. Trix index values varied between 3.2-3.3 in the site 1and between 2.6-2.7 in the site 2 and no eutrophication risk was detected in both stations according to the eutrophication risk scale. The phytochemical analysis (TAC, TPC and, TFC) of *Ulva lactuca, Ceramium sp., Gracilaria bursapastoris, Gelidium sp., Phyllophora crispa, Cladophora sp., Cystoseira sp., Dictyota sp*. were determined. *Ulva lactuca* and *Ceramium sp*. were the common genus detected in both stations. While *Gracilaria sp.* and *Phyllophora crispa* were detected only at Florya station, *Cystoceira sp*. and *Dictyota sp*. were detected only at Sarıyer station. The results highlighted that the highest levels of phytochemical characteristics were found in *Cystoseira sp*. and *Dictyota sp*., They can be considered as important candidates for the further use in the food and cosmetic industry due to their high capacity of total antioxidant capacity.

KEYWORDS: Macroalgae, Phytochemical, Antioxidants, Seasonal changes.

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[PP116]

DETERMINATION OF SPRING WATERS OF ŞIRNAK PROVINCE BY ANALYTICAL METHODS

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Water constitutes about 60-70% of the human organism. It is one of the most necessary substances for human life. Water is highly effective in maintaining and preserving body electrolyte balance. The quality of water is as important as the amount of water drunk. Water that has a balanced mineral distribution, does not contain pesticide residues and organic substances, has physical and chemical properties that comply with certain quality parameters, and does not adversely affect human health is considered healthy water [1]. Groundwater contains a greater proportion of minerals than surface water. The presence of some of these minerals is desirable. Fluorine and calcium are examples. However, none of the toxic substances should be present in the water. Substances that are harmful to health when present in water are ions such as nitrates, fluoride, toxic substances phenolic substances, arsenic, cadmium, chromium, cyanide, lead and selenium. Leaks from underground storage tanks, agricultural runoff, unfavorable industrial practices, mining practices, underground injection of waste chemicals and corrosive waters are the most important polluting practices. Therefore, as a result of urbanization and industrial processes, large amounts of pollutants are emitted to the ecosystem. Especially metals are among the most life-threatening pollutants detected in water and food. In addition, water resources are gradually decreasing, the level of the groundwater table is decreasing, and the pollution rate of surface and groundwater resources is increasing [2].

There are many spring waters in Şırnak province and its districts in the Southeastern Anatolia Region. In our study, about 10 samples from 15 different regions were taken and analyzed by ICP-MS. The results showed high levels of metals such as Aluminum, Boron and selenium.

KEYWORDS: Spring water, Metal Pollution, ICP-MS, Source Water Quality.

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[PP117]

SMARTPHONE-BASED DETERMINATION OF CARBOFURAN IN FRUIT SAMPLES BY USING MAGNETIC MOLECULARLY IMPRINTED POLYMER COATED ZIF-8

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Carbofuran is a carbamate insecticide that controls insects in plants such as maize, rape, sorghum, sugar beet, sunflowers, vegetables, and some fruits [1]. In this study, A simple methodology was used by using carbofuran imprinted polymer coated on the surface of magnetic ZIF-8 [2]. The color change was based on the alkaline hydrolysis of carbofuran, at room temperature, on the surface of the composite to yield carbofuran-phenol which can be coupled with diazotized sulphanilic acid and produce orange color. The new adsorbent was characterized using SEM and FTIR spectroscopy. The affecting parameters such as pH and time were optimized. The changes in color upon reaction with carbofuran were detected using a smartphone camera through RGB profiling. This standalone method indicated good sensitivity and low interference. Calibration with spiked samples with slopes for (R + G + B) pixels revealed an exponentially increasing calibration curve with a linear detection range of 10-800 μg/dL, The developed method has the potential to be used for simple detecting of carbofuran in fruit samples. The obtained results were also confirmed with the HPLC DAD method.

KEYWORDS: Carbofuran, imprinted polymers, ZIF-8, pesticide

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[PP118]

CLEANING VALIDATION OF ANTINEOPLASTIC AND IMMUNOSUPPRESSANT AGENTS IN MANUFACTURING EQUIPMENT OF THE PHARMACEUTICAL INDUSTRY

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The main goal of equipment cleaning validation is to consistently return the materials used to a predetermined level of cleanliness which allows for scientifically trusted results. [1]. Cleaning validation is a method of establishing verification that the cleaning processes for manufacturing equipment prevent product contamination. Cleaning validation should be properly documented and demonstrative of Current Good Manufacturing Practices (CGMP) for finished pharmaceutical products. Ineffective cleaning procedures may result in the production of faulty products contaminated with the previous product, cleaning agents, or other external substances. Avoiding cross-contamination situations is one of the main goals of the recent European Guidelines to Good Manufacturing Practices (GMP) updates [2-3]. Several EU Guidelines for the GMP annexes were modernized to establish new requirements for cross-contamination controls. Strong cleaning validation and implementation of health-based exposure limits have been identified as effective ways to avoid cross-contamination [4]. For the allowable residual limit, several mathematical equations and calculations depend on the known daily dose or the toxicological data together with certain safety factors. Thus, the cleaning validation includes three separate activities: The first is setting up acceptable residue limits for the pharmaceutical. The second is the development and validation of the method for the ascertainment of the purity of the drug from the equipment surfaces. The third is the development and validation of cleaning procedure that is employed to eliminate drug residuals from the fabrication surfaces [5]. In this study, LC-MS/MS methods were developed and validated for residual estimation of antineoplastic (Lenalidomide, Docetaxel) and immunosuppressant (Tacrolimus) agents in swab samples and rinse solutions from production area equipment surfaces (containers, filling machines, blister machines, Frewitt oscillating granulator). The difficulty in cleaning validation is to create analytical methods that are precise enough to identify traces of the drug's active compounds left over on the surface of pharmaceutical manufacturing equipment after cleaning. Linearity was demonstrated 1.0 - 100.0 ng/mL for antineoplastic agents and 0.5 – 50.0 ng/mL for the immunosuppressant ($r^2=0.999$). The swab sampling method was developed and validated in order to acquire an appropriate recovery level (>90%). The limit of detection and the lower limit of quantification results were found as 0.2 ng/mL and 1.0 ng/mL for antineoplastics and 0.2 ng/mL and 0.5 ng/mL for immunosuppressant respectively. Intraday and interday accuracy and precision studies were in accordance with the requirements of the method validation guideline of ICH Q2(R1). The studied methods were appropriate for cleaning control analysis within good manufacturing practices.

KEYWORDS: Cleaning Validation, Cleaning Control, Good Manufacturing Practice, Antineoplastic and Immunosuppressant Agents, Pharmaceutical Industry

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[PP119]

NEOPTERIN, KYNURENINE, AND TRYPTOPHAN AS NEW PROGNOSTIC MARKERS IN HOSPITALIZED PATIENTS WITH SARS-CoV-2 INFECTION

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COVID-19 is a respiratory infection that often appears with only mild symptoms. However, the body can react to a virus attack with a cytokine storm, lung or multiple organ failure, and even can lead to death [1]. Unfortunately, the COVID-19 pandemic caused many deaths also due to its unknown management and limited healthcare capacity. Markers of immune system activation, such as neopterin and kynurenine, were already proven as good prognostic markers related to the severity of the disease even before the start of its treatment [2].

Regarding our previous work, we studied between the 4th and 7th day after hospital admission the potential of neopterin, kynurenine, and tryptophan as predictive biomarkers despite the influence of treatment (even after corticoid administration) on their information value. Instead of a radioimmunoassay or enzyme-linked immunosorbent assay, which are widely used in clinical laboratories for selective and sensitive quantitation of the potential biomarkers in serum and urine, we applied methodologies based on liquid chromatography coupled with mass spectrometry or fluorescent detection. Combined with a simple and fast sample preparation, a large sample series of serum or urine can be effectively processed.

The study's results revealed a statistically significant decrease in the high levels of the biomarkers after immune system activation after sampling during the 4th to 7th day compared to the initial sampling during the first days after admission to the hospital due to the applied treatment. Moreover, a more significant decrease in neopterin, kynurenine, and tryptophan concentrations was observed in survivors compared to deaths. Detailed results will be discussed.

KEYWORDS: UHPLC-MS/MS, HPLC-FLD/DAD, immune system activation markers, clinical research, SARS-CoV-2.

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[PP120]

STUDY DESIGN FOR DETERMINATION OF DRUG SUBSTANCES STABILITY IN SOLUTIONS AND BIOLOGICAL SAMPLES

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Drug stability knowledge is important for successfully detecting and quantifying analytical results. Many factors can affect the concentration of analytes in biological samples, such as pH, microbiological growth, and temperature changes [1]. Especially in toxicology, drug residue, doping, and forensic analysis, in cases where the analysis cannot be performed immediately after sample collection or in case of possible objections to the results, it is essential to determine the appropriate transport and storage conditions in order to concretely reveal the changes in the concentration of the analyte, and it is crucial to perform stability studies to determine time and matrix-dependent changes in drug concentrations [2,3]. Moreover, the stability of the working solution must be known in order to determine the shelf life of biological samples and standards for use in proficiency testing and reference material production and to assess whether the potential stability problem is due to the structure of the substance [4]. However, it has been frequently emphasized in the literature that in many of the methods developed and validated to determine the concentration of substances, the fact that stability studies have been carried out for limited periods of time or not is a crucial parameter deficiency [2,5]. Therefore, carrying out and evaluating the stability study of each substance in accordance with a comprehensive plan reveals important data in terms of both the stability of the method and the evaluation of both the structures of the substances and their interactions with the sample and, thus the correct interpretation of the results. For this purpose, a study design was suggested for both sample and working solution under storage conditions of -20°C, +4°C, +20°C dark, +20°C light, and even -80°C for long-term stability using various validation guidelines and literature data [6]. For short-term stability, a comprehensive study plan was presented to identify and study extreme conditions dwell time in the autosampler and to evaluate the effect of freeze-thaw cycling. In addition, the different methods used in calculating and evaluating the results of stability studies reported in the literature are discussed. The criteria of international guideline for bioanalytical methods are also revisited to conduct a protocol for the stability studies from biological matrices.

KEYWORDS: Stability, biological samples, validation.

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[PP121]

THE EDIBLE MUSHROOM, *INFUNDIBULICYBE GEOTROPA* (BULL.) HARMAJA TRIGGERS APOPTOSIS IN HUMAN COLON CANCER (Caco-2) CELL LINES

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Many groups have reported that mushrooms possess anticancer activities. For over three decades, mushrooms have been approved as food additives against cancer in Japan and China [1]. Since cancer incidence increases yearly, researchers focused on studying mushrooms. This study aims to investigate the cytotoxic potential and apoptosis analyses of petroleum ether extract of *Infundibulicybe geotropa* (Bull.) Harmaja, which is an edible mushroom, against colorectal cancer (Caco-2) cell lines. The MTT 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay was used to determine the cytotoxic activity to find the EC_{50} value. The apoptotic effect was performed using three different approaches; namely, image cytometry analysis using the Annexin V-FITC/PI apoptosis detection kit, Western-Blot analysis using the antibodies of the proteins involved in apoptosis, and Real-Time PCR (qPCR) for determination of mRNA level of genes involved in apoptosis.

I. geotropa extract caused dose-dependent inhibition of Caco-2 cell lines proliferation. The EC_{50} value was found to be 87.51±1.01 µg/mL. The image cytometry results showed that *Infundibulicybe geotropa* petroleum ether extract triggered a 5.5-fold of apoptotic cells compared to the control group. According to the real-time PCR analysis, the petroleum ether extract increased the expression level of the *BAX* gene 3.6-fold while it decreased the expression of the *BCL-2* gene 1.2-fold ($p<0.05$) compared to the control group. Moreover, the extract also notably increased mRNA expressions of *Caspase 3, 8,* and *9* (4.3, 1.9, and 4.9-fold, respectively). Results were normalized using GAPDH (glyceraldehyde 3-phosphate dehydrogenase). In addition, the anti-apoptotic BCL-2 protein level was significantly decreased. However, BAX, caspase 3, and 8 protein levels were significantly induced as a result of extract treatment.

Genes control extrinsic and intrinsic pathways in apoptosis. It can be said that petroleum ether extract induces apoptosis by affecting both intrinsic and extrinsic pathways. Therefore, the isolation and elucidation of the bioactive compounds are needed for further studies.

KEYWORDS: *Infundibulicybe geotropa,* apoptosis, cytotoxicity, colon cancer cell lines.

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[PP122]

WHY pKa's MATTER IN MEDICINAL CHEMISTRY AND A DRUG DISCOVERY

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The acid-base property of a drug molecule is a key parameter in drug development because it governs solubility, absorption, distribution, metabolism and elimination. Particularly for the development of new APIs, pKa has become of great importance because the transport of drugs into cells and other membranes is a function of the physicochemical properties and the pKa of drugs [1]. Determination of pKa values by potentiometric titration is a fundamental technique in analytical chemistry and is essential for understanding the ionization behavior of acids and bases in various chemical systems.The pKa of a drug is an important physicochemical property to consider in the drug discovery process, given its importance in determining the ionization state of a molecule at physiological pH. Adjusting the basic structure of an amine and the population of its ionized form in water can affect: On-target and off-target effects, lipophilicity, permeability Cytochromes and other enzymes Possibility of salt formation and protein binding, among other properties. In this study, three drug molecules were selected and studied and their pKa values were determined potentiometrically. The pKa values of the active ingredients Diclofenac, clavunate potassium and Levetirecetam are 3.31, respectively; It was found to be 3.53 and 11.3. pKas less than 7 are unlikely to be significantly protonated at physiological pH (~7.4).

KEYWORDS: pKa, drug discovery, potentiometric titration, acid-base property.

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[PP123]

SYNTHESIS, PURIFICATION AND APPLICATION OF ISOTOPIC DERIVATIVES OF VARIOUS ANTIEPILEPTIC AND ANALGESIC DRUG ACTIVE SUBSTANCES IN ANALYTICAL DETERMINATION METHODS

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Epilepsy is a neurological disease that occurs as a result of concomitant seizures accompanied by convulsions and sensory disorders resulting in loss of consciousness [1]. Phenacemide, which has been especially used in the treatment of epilepsy, is an active compound in the class of anticonvulsant or antiepileptic drugs (AEDs) [2,3]. In the first step of this study, phenacemide and deuterated-phenacemide were synthesized in our laboratory. The proper amounts of phenyl acetyl chloride and dry acetonitrile were transferred into the balloon for the synthesis of phenacemide and then urea was added onto the solution. After, this solution was refluxed for 6 hours at 50 ºC to complete the synthesis. In ethyl acetate:hexane (3:1) system, TLC was applied to control the completion of synthesis. Then, the obtained substance was washed with ether to remove the possible impurities. All these processes were repeated to synthase phenacemide-d_3 (urea-d_6 was used in the synthesis of phenacemide-d_3). Mass spectrometry (MS), Fourier transform infrared (FT-IR) and nuclear magnetic resonance (NMR) systems were employed to characterize phenacemide and phenacemide-d_3. In future studies, chromatographic conditions are going to be optimized to enhance the signal to noise ratio belonging the analyte in order to reach low detection limits. After the optimization studies, system analytical performance studies are going to be performed to determine limit of detection (LOD), limit of quantitation (LOQ), dynamic range and coefficient of determination (R^2). Finally, the developed analytical method is going to be combined with quadruple isotope dilution (ID) strategy thanks to the synthesis of isotopically labelled material (phenacemide-d_3) to enhance accuracy and precision.

KEYWORDS: Epilepsy, neurological disease, antiepileptic drug, phenacemide, quadruple isotopic dilution strategy.

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[PP124]

SYNTHESIS, DOCKING STUDIES AND BIOLOGICAL CHARACTERIZATION OF NOVEL LIPOSOMAL IMATINIB ANALOGUES AS POSSIBLE ANTICANCER AGENTS

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Imatinib (Gleevec, STI571) is a clinically significant ATP analogue inhibitor that suppresses the intracellular protein tyrosine kinase domain of namely BCR-ABL oncogenic protein. Imatinib has entirely revolutionized the treatment of chronic myeloid leukemia (CML) and Acute lymphoblastic leukemia (ALL) as well as certain solid tumors with oncogenic modifications.[1]

The proposed methodology efficiently bypasses certain challenging processes, minimizes labor as well as time, gives relatively high yield and purity and has the potential to be employed for the synthesis of several analogues.

A 3-step reaction was carried out to generate several imatinib derivatives. Spectroscopic approaches were utilized to characterize the structures of the novel compounds.[2] Docking and molecular dynamic modeling investigations were implemented on Human Abl kinase protein (PDB ID: 2hyy), revealing high structural flexibility and binding free energy in comparison to commercial imatinib. Liposome encapsulation experiments, cell culture, and MTT assay on different types of BCR-ABL-positive cell lines will be further conducted.

KEYWORDS: Imatinib derivatives, tyrosine kinase inhibitors, BCR-ABL inhibitors, leukemia, anti-cancer agents, molecular docking, drug design.

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[PP125]

MODIFICATION HYDROXYAPATITE FROM CATTLE BONES WITH BIOPOLYMERS TO REMOVE HEAVY METAL FROM ENVIRONMENTAL SAMPLES AND LIMIT THE BIOFILM FORMATION

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Heavy metals are the most threatening pollutants for soil and water sources because of their risky perniciousness and stability which are non-biodegradable in environment [1]. Therefore, it is important to decrease the concentration of heavy metals from water sources with right dissolution [2]. Hydroxyapatite is one of the most attractive biomaterials owing to its chemical resemblance to the mineral part of hard tissue [3,4]. Therefore, it exhibits high sorption capacity towards the heavy metals. In this work, a biocompatible material from cattle bone containing hydroxyapatite was modified by various biomolecules (e.g., amino acids, protein) and used to remove heavy metals (Cu, Zn, Ni, Pb etc.) from environmental aqueous solutions. Examinations were carried out using a batch technique under different experimental conditions such as pH, initial Pb ion concentration and adsorbent dose. Moreover, the biofilm formation over modified hydroxyapatite sorbent was examined using different types of bacteria and the results were compared by the modification route, heavy metal removal and biofilm formation. The analyte elements were determined in the range of 95% in certified reference materials. The utilization of hydroxyapatite and its modifications is expected to be a cheap and eco-friendly method for eliminating metals and limiting biofilm formation.

KEYWORDS: Sorbent, modification, heavy metal ions, biofilm.

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[PP126]

SYNTHESIS OF A NEW HETEROCYCLIC MOLECULE THAT MAY BE A GSK-3β INHIBITOR

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Heterocyclic compounds, one of the common and classical branches of organic chemistry, have a wide range of biological activities and industrial importance. [1]. Among heterocyclic compounds, those containing nitrogen have an important place in biological and pharmaceutical applications. For this reason, the synthesis of heterocyclic compounds containing this atom has attracted attention in recent years [2]. The world's best-selling drugs have been nitrogen-containing heterocycles [3].

The maleimide structural motif is abundant in a wide variety of natural products from both terrestrial and marine sources. Natural products containing this motif have been reported to have various biological activities, including GSK-3 inhibitory activity [4]. It is also known that indole-containing derivatives show very high GSK-3 inhibition. When the literature is examined in detail, it will be seen that studies on the subject are still being published in active journals. For this purpose, this study aimed to examine the activity and structure analysis by adding morpholine to the maleimide derivative. First of all, FTIR, ^{1}H-NMR, APT and QTOF studies were carried out and the structure was illuminated by spectroscopic methods and then sent to the relevant unit for activity studies.

KEYWORDS: Maleimide, GSK-3β, heterocyclic compounds, spectroscopic analysis

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[PP127]

POST COVID SYNDROME IN PATIENTS HOSPITALIZED WITH SARS-COV-2 INFECTION - NEW PROGNOSTIC MARKERS EVALUATION

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Coronavirus disease 2019 (COVID-19) is an acute viral respiratory infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 spread rapidly throughout the world, leading to a global pandemic with a profound impact not only on healthcare systems but also on the economy and society. According to the WHO, there were 770 085 713 confirmed cases of COVID-19 worldwide, and more than 6 956 176 people died [1].

Most people who develop COVID-19 fully recover, but current evidence suggests approximately 10–20% of people experience a variety of mid and long-term effects after they recover from their initial illness. In fact, most published studies on post-COVID symptoms found that 50–70% of hospitalized patients exhibit several post-COVID symptoms up to 3 months after hospital discharge. The British Medical Association defines a syndrome “as a set of medical signs and symptoms which are correlated with each other and associated with a particular disease” [2].

Neopterin and kynurenine/tryptophan are well-established immune activation biomarkers. Serum or urinary neopterin concentrations reflect the activation of the immune system and predict outcomes across a range of different disorders, including viral infections [3].

The aim of our study was to assess the levels of these new markers in hospitalized patients with subsequent post-COVID syndrome followed up over the next 9 months after a positive PCR SARS-CoV-2 test.

Serum and urine samples were obtained on the 1st to 4th day and 4th to 7th day after hospital admission and then 3rd, 6th, and 9th month after a positive PCR SARS-CoV-2 test. Modern HPLC-FLD/PDA-MS/MS methods were used to measure neopterin, kynurenine, and tryptophan in urine and serum.

We observed a statistically significant increase of neopterin, kynurenine, and kynurenine/tryptophan ratio in blood at admission (1st - 4th day of hospitalization) in the group followed post-COVID syndrome in comparison with the group without post-COVID syndrome.

Levels of selected markers were compared with a control group of healthy volunteers. We found that even after 9 months, most of the marker’s levels increased in comparison with a control group, mainly in the blood. Detailed data will be presented.

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[PP128]

SYNTHESIS OF 4-ETHYNYLANILINE BASED SCHIFF BASE, ANION SENSOR PROPERTIES, ANTIMICROBIAL ACTIVITY AND INTERACTION WITH DNA

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Schiff bases are widely used for industrial purposes and also exhibit a wide range of biological activities. Studies on the most promising antimalarial, antibacterial, antifungal and antiviral properties of Schiff bases are given in several reviews [1-3]. As synthetic compounds, Schiff bases are used as versatile tools in numerous applications, such as fluorescence on/off sensors for the determination of various analytes (e.g. metallic compounds). Therefore, they can be used to identify toxic ions and/or determine their species in environmental media. A wide range of Schiff bases used in sensing applications for metallic cations and anions in various environmental and biological media are given in a review [4].

In the present study, 4-ethynylaniline-based Schiff base was synthesized from the reaction of 2-Hydroxy-3-methoxy-5-bromobenzaldehyde and 4-ethynylaniline in ethanol. The synthesized compound was characterized by elemental analysis, FTIR, UV-Vis and NMR spectroscopic methods. The antibacterial activity of the compound was investigated by MIC method against various bacterial cultures. DNA binding and DNA fragmentation properties were also investigated by UV-Vis and gel electrophoresis. The compound binding electrostatically to calf thymus DNA (CT-DNA). Furthermore, DNA cleavage study showed that the compound cleaved DNA without the need for external agents. The colorimetric response of the Schiff base in DMSO to the addition of equivalent amount of anions (F^-, AcO^-, CN^-, OH^-, $H_2PO_4^-$, Br^-, I^-, SCN^-, ClO_4^-, HSO_4^- and N_3^-) was investigated. In this regard, while the addition of F^-, AcO^-, $H_2PO_4^-$, CN^- and OH^- anions into the solution containing the title compound resulted in a significant color change, the addition of Br^-, I^-, SCN^-, ClO_4^-, HSO_4^- and N_3^- anions resulted in no color change. Also, there was a change in the color of the solutions under both long wave and short wave UV lamp. This reveals that the compound shows fluorescent properties.

KEYWORDS: Schiff base, colorimetric sensor, DNA cleavage, DNA binding, antibacterial activity.

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[PP129]

ANALYSIS OF LIPOPHILIC VITAMIN LEVELS IN HOSPITALIZED PATIENTS WITH COVID-19

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In recent years, attention to fat-soluble vitamins (A, D, E, K) has increased significantly in clinical medicine. Research is now focusing on a thorough understanding of their contribution to disease prevention, pathophysiology, and therapeutic use [1]. Nowadays, vitamins are also extensively studied in the context of COVID-19, since they play important roles in immune function, such as the ability to regulate the expression of Aryl Hydrocarbon Receptors (AHR) [2, 3]. The AHR is a transcription factor that plays a multifaceted role in immune regulation, detoxification, and inflammation. In COVID-19, the dysregulation of the immune response and excessive inflammation are associated with severe disease outcomes, so AHR's role in inflammation is of particular interest [4]. Regarding these findings, reliable and precise laboratory methods are necessary. In the Research Laboratory at University Hospital Hradec Králové several liquid chromatography methods for vitamins analysis were developed, validated, and used for clinical studies relating to COVID-19.

Here we would like to present our application of UHPLC-MS/MS technique for the determination of 25-hydroxyvitamin D3 and HPLC-PDA method for analysis of vitamins A and E in human serum from patients hospitalized with COVID-19. We aimed to evaluate vitamin levels in 108 serum samples from patients with Omicron and Delta variants in a period from Nov 2021 to April 2022.

We observed that fat-soluble vitamins do not have prognostic evidence. Nevertheless, vitamin D levels lowered by 37% in comparison to a control group, even though patients were supplemented. These findings suggested that it would be advisable to increase the dosage of supplementation in the future. All fat-soluble vitamin levels were lower than physiological values. Detailed data will be presented.

KEYWORDS: Fat-soluble vitamins, COVID-19, UHPLC-MS/MS, HPLC-PDA.

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[PP130]

CONJUGATED POLYMER BASED GOLD-NICKEL MULTIFUNCTIONAL MICROMOTOR FOR ENVIRONMENTAL MONITORING

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Micro/nanomotors have emerged as promising platforms since demonstrate the ability to efficiently convert chemical energy into motion like nature uses biochemistry to power biological motors. They are promising for environmental and biomedical applications, ranging from water remediation, and sensing to active drug delivery and precise surgery. For environmental applications, the micro/nanomotors either are designed with functional materials in their structure or are modified to target pollutants [1].

Herein, we designed a new generation micromotor with a functional material such as conductive polymer in its structure. We have produced a new generation micromotor with a tubular magnetic drive, which exhibits steerable motion in the water and contains dansyl-based polycarbazole, gold, and nickel, respectively. The structural and chemical properties of the resulting micromotor were characterized by XPS and SEM-EDX. The obtained micromotors were used for the selective detection of Zn(II) heavy metal ions with three different effective methods: fluorometric, magnetic, and amperometric. We hope that the micromotor thus obtained has the potential to be used as a new generation of "smart devices" for environmental monitoring and water purification and can play an important role in environmental applications in the near future.

KEYWORDS: Nanotechnology, conjugated polymer, micromotor designing, environmental monitoring, multifunctional detection

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[PP131]

INCREASING THE LIGHT EMITTING EFFICIENCY OF CARBAZOLE AND CHOLESTEROL-DERIVED MOLECULE THROUGH MOLECULAR ENGINEERING

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Luminescence molecules are of great interest due to their use in the fields of third-generation light-emitting materials in organic light-emitting diodes (OLED), bioimaging, pharmaceutical nanocarriers, and fluorescence sensors [1]. The fluorescence properties and intensities of such light-emitting molecules vary in different solution concentrations. While the molecule shows severe fluorescence characteristics, damping can occur with the realization of the aggregation event, as well as the increase in emission due to aggregation can be detected by increasing the fluorescence intensity with redshift.

Carbazole compounds increase the conductivity properties of the molecules they are attached to with their strong electroactive properties and at the same time give them severe fluorescence properties [2] By binding the carbazole compound through two hydroxy groups of the methyl-3,5-dihydroxy benzoate compound, the conductivity and fluorescence properties of the designed molecule were further increased, and the aggregation property was gained by binding the cholesterol molecule consisting of multiple hydrocarbon rings and hydrocarbon chains. The structure of the compound, which was synthesized as a new molecule with different properties was characterized by ^{1}H-NMR and FT-IR techniques and its aggregation properties were examined. In this study, solutions containing 1.10^{-4} M AG1 were prepared in THF solvent medium, and water was added to these solutions with increasing percentages (1-90%). As the concentration of water increases, the emission intensity occurring at 353 nm decreases, while the emission intensity occurring in the region of 521 nm increases. At the same time, both a decrease in fluorescence and an increase in the intensity of fluorescence in the visible region were detected due to the aggregation event. Molecules containing carbazole and cholesterol compounds gather in close proximity to each other and form a new fluorescence band as a result of intermolecular interactions. This is observed by an increase in the severity of emissions in the spectrum.

KEYWORDS: Aggregation, carbazole, conductivity, fluorescence intensity.

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[PP132]

INVESTIGATION OF THE EFFECT OF DIFFERENT DESIGN ROUTES IN 3D PRINTING ON ELECTRODE PROPERTIES

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Additive manufacturing technology can be defined as the layer-by-layer creation of 3D models designed on digital platforms as computer-aided design (CAD). In additive manufacturing processes, thermoplastic filaments, resins or powders are usually used as source materials. Today's one of the most widely used 3D printing methods among various 3D printing methods, fused deposition modeling (FDM) is preferred due to its material economy, availability of various materials and flexibility. Therefore, FDM is highly preferred in various fields such as architecture, engineering and education [1, 2]. FDM technique will become more common as 3D printers reduce the cost and increase the number of material availability [3]. New design opportunities have emerged in favor of 3D technologies, such as printing chemistry reactors, finding non-traditional geometries, adapting sensor technologies, rapidly iterating design variations for optimization of reaction parameters, and the opportunity to prepare some key components of the device. However, printing parameters will determine the choice of the appropriate printing process for chemical application. In this study, two different design methods which are the conventional CAD method and the new FullControl GCode Designer method presented in the literature were used for electrode printing [4]. The surfaces of electrodes that were printed by different methods were modified with silver structures by electrochemical deposition after the electrochemical activation step. The bare and modified electrode surfaces were characterized by electrochemical and microscopic techniques. Two different design methods applied in 3D printing techniques were evaluated in terms of their effect on the preparation of modified surfaces and their contribution to the properties of the post-modified surfaces.

KEYWORDS: 3D printing, additive manufacturing, computer aided design (CAD), fused deposition modeling (FDM).

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[PP133]

GREEN EXTRACTION OF ANTI-AGING POLYPHENOLS

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Polyphenols have been reported as being useful for well-being and longevity, and in reducing the risk of aging-related chronic diseases [1]. Polyphenols are a type of micronutrient found in plant foods like fruit, vegetables, wholegrains, nuts, red wine, dark chocolate, tea, coffee, spices, and herbs. There are over 8000 different types of polyphenols, each with their own linked health benefits and uses. The more colour and diversity we introduce into our diet, the more antioxidants, and polyphenols we will obtain, and thus, they may support aging in a natural and healthy way. For these reasons, daily consumption of a controlled amount of colourful fresh fruit, vegetables or supplements is highly recommended. Polyphenol supplements have been around for a while now, offering people the advantage of getting a quick, easy, and consistent dose of polyphenols. Polyphenol supplements may contain concentrated polyphenols, but they do not contain the same nutrients, e.g., fibre, starch, sugar, vitamins, and minerals that polyphenol-rich foods do. Current trends in extraction techniques have largely focused on green solvents. Recently, more efficient green extraction methods, such as subcritical water extraction (SWE) and microwave assisted extraction (MAE) have been used for the isolation of polyphenols from various plants [2-4]. These extraction techniques are not only cheaper and faster, but being considered eco-friendly, they also enable these products to claim a green label. We have recently extracted polyphenols from different plant materials using SWE and MAE technologies at both lab and industrial scale. Various polyphenols (hesperetin, hesperidin, naringin, naringenin, phlorizin, phloretin, thymol, carvacrol) were extracted from citrus peels, apple/cherry barks, origanum and thymbra herbs using green extraction technologies.

KEYWORDS: Polyphenols, Green extraction, Subcritical water extraction, Microwave assisted extraction

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[PP134]

APPLICATION OF NOVEL MAGNETIC DEEP EUTECTIC SOLVENT@ZN-MOF NANOCOMPOSITE FOR EXTRACTION OF CARMOISINE DYE FROM FOOD AND WATER SAMPLES FOLLOWED BY SPECTROPHOTOMETRIC ANALYSIS

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The category of food additives known as synthetic colorants is particularly significant. They are extensively utilized in the food and feed sectors all over the world because of their low cost, great efficacy, and outstanding stability [1]. A synthetic red azo dye called Carmoisine is made from coal tar pitch and is frequently used as a food and beverage coloring. It contains aromatic ring structures and also functional groups like hydroxy, sulpho, and azo, which when consumed in excess can have negative effects on human health. In this way, the necessity of careful monitoring of the concentration of Carmoisine in related products and the use of a quick, easy, sensitive and cheap analytical method for its extraction and identification has been emphasized [2,3]. In the current study, a novel adsorbent based on magnetic deep eutectic solvent@Zn-MOF was successfully synthesized and utilized for the magnetic solid phase extraction of Carmoisine dye in various water and food samples followed by spectrophotometric analysis. With the use of this novel magnetic adsorbent, the absorption and desorption steps no longer required the use of a centrifuge, and the extraction procedure was made more effective, quick, and simple. The parameters affecting on the extraction procedure (pH of sample solution, adsorption and extraction time, adsorbent amount, eluent solution, and sample volume) were optimized. Under optimal extraction conditions, limit of detection was 2.4 μg L^{-1}, relative standard deviations up to 4.2%, and relative recoveries in the range of 96.2-99.8% were obtained. The proposed method was successfully applied for extraction of model analyte (Carmoisine dye) in different real samples.

KEYWORDS: Magnetic deep eutectic solvent, metal organic frameworks, solid phase extraction, Carmoisine, spectrophotometry.

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[PP135]

A GREEN NATURAL DEEP EUTECTIC SOLVENT BASED LIQUID PHASE MICROEXTRACTION OF RHODAMINE B PRIOR TO SPECTROPHOTOMETRIC DETECTION

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Rhodamine B dye, which is a member of the xanthene family, finds wide application as a colorant in various industries such as food, pharmaceuticals, cosmetics, etc. However, it has been observed to have irritating, carcinogenic, chronic, genotoxic, neurotoxic, and other toxic effects on both humans and animals. Therefore, its use has been prohibited in many countries. Nevertheless, due to its low price, stability, chemical-light resistance, and high effectiveness, it continues to be illegally used. The rapid, accurate, sensitive, reliable, and trace-level analysis of this dye is of great importance. However, before analysing the target analyte to various instrumental analyses, it needs to be isolated and enriched from the complex matrix environment through sample preparation. In recent years, natural deep eutectic solvents (NADES), which represent the principles of green chemistry, have been used as next-generation solvents in separation and enrichment. NADESs have become versatile alternatives to conventional solvents due to their low toxicity to humans and the environment, low cost, biodegradability, natural abundance, and physicochemical properties [1-3].

In this study, a liquid-phase microextraction method using a NADES composed of levulinic acid and thymol (1:1) was developed for the separation and enrichment of Rhodamine B dye. The analytical parameters of the method (pH, type and volume of NADES, matrix ion effects, sample volume, etc.) were optimized. Rhodamine B was quantitatively recovered at pH 7.0 using 0.4 mL NADES. The developed method was successfully applied to real samples, and its accuracy was demonstrated using the addition-recovery method.

KEYWORDS: NADES, rhodamine B, liquid phase microextraction, environmental samples, UV-Vis spectrophotometry.

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[PP136]

SYNTHESIS OF $BaTiO_3$@MIL-53 (Al) COMPOSITE MATERIAL AND ITS APPLICATION TO PRECONCENTRATION AND SEPARATION OF CADMIUM IN SEAFOODS

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Cadmium is considered extremely harmful to live organisms and people, and it has biological activity in both terrestrial and aquatic animals. Agriculture and industrial development have resulted in higher levels of cadmium in agricultural soils. Cadmium enters ecosystems through a variety of anthropogenic activities and environmental pollutants [1]. Solid phase extraction (SPE) is a common preconcentration/separation technique and it has numerous advantages, including its simplicity. Several analytes can be enriched and separated at the same time. Furthermore, using SPE procedures, high preconcentration factors can be obtained. For SPE, the main properties of the solid phases should be high surface area, high purity, and good sorption properties such as porosity, durability, and uniform pore distribution. Recently, efforts have been made to discover metallic oxide materials and metal organic frameworks with superior performance [2-3].

In this study, a SPE method using $BaTiO_3$@MIL-53 (Al) as an adsorbent was developed to separate, enrich and determine trace amounts of cadmium from seafoods. Measurements were made using a high resolution continuous source atomic absorption spectrometer. Parameters such as pH, sorbent amount, extraction time, eluent type and volume have been optimized. Then, the potential effects of the matrix were investigated by adding the species that could impair the determination of cadmium. The optimum pH value was found to be 5.0. Thirty mg of $BaTiO_3$@MIL-53 (Al) adsorbent was used during the study and the enrichment factor was found to be 80 times. Finally, the method was validated using certified reference materials and applied for the determination of cadmium in shrimp, mussel and tuna fish.

KEYWORDS: Solid phase extraction, cadmium, metal organic framework, seafoods, metallic oxides.

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[PP137]

DETERMINATION OF SUDAN III IN FOOD SAMPLES BY UV-VIS SPECTROPHOTOMETRY AFTER SOLID PHASE EXTRACTION

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The widespread use of illegal dyes in foodstuffs has become an issue of concern for human health. Sudan dyes are a type of synthetic dye that has an azoic structure and aromatic rings. Sudan dyes are widely used in industries of color waxes, textiles, polishes, oils, and plastics due to their bright color and low cost. Additionally, Sudan dyes have frequently been illegally added as a colorant to foods, particularly chili-containing foods, tomato sauce, and red wine. However, even a trace amount of these compounds can be harmful to consumers' health when consumed or absorbed through skin contact. As a result, developing an efficient method for detecting trace Sudan dyes in foodstuffs is critical for human life security [1]. Solid phase extraction (SPE) has attracted more interest from researchers due to its high adsorption ability and ease of operation. In comparison to traditional methods, SPE has the advantages of being simple, quick, and easy to operate, as well as saving organic solvents. Furthermore, because of the increased contact area between target molecules and adsorbents, it can provide higher adsorption capacities [2]. Titanium aluminum carbide (Ti_3AlC_2) is a non-oxide compound with hexagonal layers of material that melt quickly. It has received a lot of interest because of its unique properties such as superior thermal stability and electrical conductivity, relatively good environmental stability, damage tolerance, nontoxic effect, low cost, and ease of production [3].

In this study, the SPE method using $Ti_3AlC_2@MoS_2$ hybrid material as an adsorbent was developed for the separation enrichment and determination of Sudan III dye from matrix media. In this study, pH 3.0 phosphate buffer was utilized and the optimum recovery value was acquired at pH 3.0. Measurements were made in a UV-Vis spectrophotometer settled to 510 nm. The method was validated by additionional recovery experiments on food samples.

KEYWORDS: Ti_3AlC_2, max phase, dispersive solid phase extraction, food samples, Sudan dyes.

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[PP138]

SYNTHESIS OF MXENE SHEETS AS AN EFFECTIVE ADSORBENT AND ITS USE IN DISPERSIVE SOLID PHASE MICROEXTRACTION FOR LEAD DETERMINATION

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Heavy metals such as copper, mercury, cobalt, lead, chromium, and cadmium have caused damage on the ecosystem. Amongst these metals, lead is very poisonous lead toxicity is harmful to living beings, causing harm to the human brain, liver, kidneys, and reproductive system. Dispersive solid phase microextraction (DSPME) has grown in popularity as an alternative to conventional procedures that employ organic solvents and need heating. DSPME has several advantages, including being selective, having a high enhancement factor, being rapid, relatively inexpensive, green and environmentally friendly, and not requiring a chelating reagent [1-2]. By HF etching of the Max Phase (Ti_3AlC_2) structure, MXenes with an accordion-like shape can be produced. MXenes have unusual shape and high conductive properties make it useful in a variety of applications, including sensors, electronics, catalysts in the chemical industry, conductance-enhancing additives in polymers, and energy storage devices. Because of its surface functional groups, hydrophobic interactions, and layered structure with a high active surface area, it is an attractive sorbent. MXenes is an effective adsorbent for a variety of chemicals due to its wide specific surface area, many active sites, high porosity, and stability [3].

In this study, a DSPME method using MXenes as an adsorbent for rapid and sensitive preconcentration/determination of lead at trace levels in water and tobacco samples before determination the high-resolution continuum source flame atomic absorption spectrometry was developed. Adsorbent quantity, pH, adsorption and desorption interaction times, eluent volume, model solution volume, and matrix effects were optimized. While the optimum pH was found to be 9.0, quantitative recovery efficiencies were obtained with 2.5 mg Mxene adsorbent. 0.1 M HNO_3 was used as eluent. The method was validated with a certified tobacco and water reference materialse.

KEYWORDS: Dispersive solid phase microextraction, lead, water samples, tobacco samples, preconcentration.

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[PP139]

DIFFERENT MORPHOLOGIES OF ZnO MICROFLOWERS AND THEIR USE IN SOLID PHASE EXTRACTION

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With the developing industrial processes and industrial production, the amount of waste thrown into nature has also increased. In addition, the predicted increase in population has increased the pollution of the environment and water resources. The necessity of more efficient use of resources in the world is important. It has become more important for us to purify polluted water resources from heavy metals effectively and efficiently [1]. Various separation and enrichment methods such as liquid-liquid extraction, co-precipitation, ion exchange and adsorption are used to remove such heavy metals from the matrix [2]. In addition, solid phase extraction (SPE) is one of the popular methods for the recovery of heavy metals [3]. Many studies showing the potential of nano/microflowers for the removal of heavy metal ions when solid phase extraction (SPE) methods are applied have recently been published [4]. SPE is performed for the enrichment and extraction of traces of analytes. For the extraction and enrichment of analytes in environmental samples, nano/microflowers with large surfaces and high adsorption capacities can be utilized.

In this study, Zinc(II)oxide (ZnO) microflowers with two different morphologies were synthesized by the hydrothermal method technique as proposed by Hasanoğlu Özkan [5]. ZnO microparticles with different morphologies and surface areas were obtained by changing the surfactants, metal salts, and temperature used during the synthesis. The products synthesized were examined adopting the Energy Dispersive X-ray spectroscopy (EDX) under the SEM, XRD, FT-IR, and BET.

In the literature, there are not many studies on the use of ZnO microflowers in heavy metal removal. We expect that both the in-depth characterisation analyses and the hydrothermal synthesis of ZnO microflowers for use in heavy metal removal in this study will greatly contribute to the literature.

KEYWORDS: Solid phase extraction, ZnO microflowers, heavy metal.

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[PP140]

EXTRACTION OF ANTIOXIDANTS FROM TURMERIC BY USING GREEN EXTRACTION TECHNIQUES: MODELING AND OPTIMIZING

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Antioxidants are natural compounds that prevent or reduce oxidative stress, which causes cell damage and potentially fatal diseases. Turmeric (*Curcuma longa* L. is used as a spice or colorant in the textile, pharmaceutical, and cosmetic industries. The main component of turmeric is curcumin. In addition to curcumin, diarylheptanoid curcuminoids, namely dimethoxy curcumin and bisdemethoxy curcumin, are also secondary components [1]. Antioxidant, antibacterial, and antitumor properties of curcumin have been reported in previous studies [2]. It is important to develop new extraction methods to obtain antioxidants from turmeric. In this study, microwave-assisted extraction (MAE) and ultrasound-assisted extraction (UAE), which are easy, efficient, and environmentally friendly green methods, were applied for the extraction of antioxidants from turmeric. The UAE technique is a useful extraction technique due to cavitational effects based on bubble dynamics. In addition, the MAE technique uses high-frequency, non-ionizing electromagnetic waves, which can facilitate extraction due to highly localized temperature and pressure. The total antioxidant capacity obtained using the CUPRAC (Cupric Reducing Antioxidant Capacity) method was used as the response in the optimization process for both methods. Solid particle size, solvent ratio, extraction time, and temperature parameters were optimized. Antioxidant activity parameters such as total antioxidant capacity, total phenolic content, and free radical scavenging activity of optimized extract were determined by CUPRAC, Folin, and 2,2-diphenyl-1-picrylhydrazyl (DPPH) methods. The curcumin contents of the obtained turmeric extracts were also determined by the HPLC-PDA analysis. As a result, optimized and modeled methods for the extraction of antioxidants from turmeric can be used as a potentially efficient and sustainable procedure in the pharmaceutical and food industries.

KEYWORDS: Antioxidant, curcumin, microwave-assisted extraction, turmeric, ultrasound-assisted extraction.

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[PP141]

A NOVEL APPROACH TO CADMIUM DETECTION IN WATER AND FOOD SAMPLES USING MWCNT@TiSiO$_4$ NANOCOMPOSITE EXTRACTION

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Heavy metals, including cadmium, are naturally occurring elements that have become widely distributed in the environment due to various human activities. Their significant toxicity has raised concerns regarding their impact on both human health and the environment, establishing them as metals with considerable public health importance [1–3]. In this research, a novel nanocomposite known as MWCNT@TiSiO$_4$ was produced using sol-gel calcination and hydrothermal synthesis techniques. The nanocomposite was thoroughly characterized using XRF, FTIR, and FE-SEM methods. This synthesized nanosorbent was utilized for micro-solid phase extraction (µ-SPE) to extract trace amounts of cadmium Cd(II) prior to its determination through flame atomic absorption spectrometry (FAAS). Various analytical parameters, such as pH, sample and eluent volumes, sorbent quantities, and eluent composition, were optimized. Furthermore, the influence of matrix components was examined. To validate the method, it was applied to analyze reference materials. The developed methodology was also employed to quantify Cd(II) levels in water and food samples collected from Kayseri, Turkey.

KEYWORDS: cadmium, water and food samples, FAAS, MWCNT@TiSiO$_4$ nanocomposite.

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[PP142]

OPTIMIZATION AND MODELING OF ULTRASONIC-ASSISTED EXTRACTION OF ALPHA-TOCOPHEROL FROM COCONUT OIL USING CHOLINE BASED DEEP EUTECTIC SOLVENTS

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Alpha-tocopherol is an antioxidant that can help protect the oil from oxidation and rancidity, which can extend the shelf life of cold-pressed coconut oil [1]. Additionally, alpha-tocopherol is also beneficial for human health, as it has antioxidant properties that can help protect cells from damage caused by free radicals. The exact amount of alpha-tocopherol in cold-pressed coconut oil can vary depending on factors such as the coconut variety, growing conditions, and processing methods. However, it is generally present in significant amounts, contributing to the nutritional and antioxidant properties of cold-pressed coconut oil. Deep eutectic solvents offer a sustainable and versatile solution for a wide range of applications, with the potential to environmental sustainability [2]. In this study, three different choline based deep eutectic solvents (DES) were studied in order to extract alpha tocopherol from commercial cold pressed coconut oil. The characterization of the solvents were performed using Fourier Transform Infrared Spectrometer (FTIR). Various parameters such as temperature, extraction time and solvent/ sample ratio were evaluated to dicuss on extraction efficiency.

The proposed ultrasonic assisted extraction method is found to be a potentially efficient and sustainable procedure in pharmaceutical and food industries for the extraction of alpha tocopherol.

KEYWORDS: deep eutectic solvent, alpha-tocopherol, ultrasonic assisted extraction

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[PP144]

SYNTHESIS AND CHARACTERIZATION OF NOVEL NICKEL COBALT SELENIDE NANO-MOSES

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Catalysts play a pivotal role in photocatalysis, separation, adsorption, energy storage and conversion, and life science applications. The catalytic properties of a material can be further boosted through structural or morphological engineering, such as size, morphology, and porosity [1]. Hetero-junctions and the presence of multimetals in a single catalyst also greatly improve its application [2, 3]. In the field of catalysis, transition metal chalcogenides continuously attract research attention due to their facile synthesis, electronic structure, environmental friendliness, low cost, tunable morphology, and excellent catalytic performance [4]. In this regard, a simple solvothermal method was used to prepare nickel cobalt selenide with a novel and unique morphology of nano-moses. The XRD data of the novel nano-moses showed that the material is highly crystalline and pure. The SEM and TEM data confirmed that the material is uniform and composed of nanosize with moses morphology. The unique nano-moses exhibited a dendrite/needle-like morphology, which utilized the maximum number of atoms to be used as active spots for the reaction. This special morphology with nanosize increases the surface area of the material and provides large active spots for the reaction, ultimately improving the catalytic applications. The synergism of Ni and Co, and the interaction of metals with selenide at their junction point, will provide a large electronic cloud with altered configuration, further improving the catalytic application of nickel cobalt selenide nano-moses.

KEYWORDS: Nano-moses; Nickel cobalt selendies; Multimetals; Metal chalcogenides.

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[PP145]

REDUCED GRAPHENE OXIDE/EPOXY NANOCOMPOSITES WITH ENHANCED MECHANICAL PROPERTIES

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The next-generation aircraft engines are designed to be lighter and stronger than engines currently in use by using composites/nanocomposites of carbon-based compounds. Polymer-based nanocomposites have been widely used in similar applications, such as adhesive materials, due to their unique electrical, thermal and mechanical properties compared to neat polymers. Epoxy/conducting filler nanocomposites with mechanical performance have emanated as a promising property in the material industry [1-2].
This study aims to investigate the thermal and mechanical properties of graphene/epoxy nanocomposites and in this work, a facile and low-cost method was adopted to prepare reduced graphene oxide (rGO)-epoxy nanocomposites. The rGO was obtained from Doruk Grafen (Anbiokim Doruk, Turkey) and characterized by X-ray diffraction analysis, Raman spectroscopy, and High-resolution Transmission Electron Microscopy (HRTEM). The rGO-Epoxy nanocomposite (rGO 5%) presented a 90% higher strain than neat epoxy. With the addition of 1% of rGO, the mechanical properties such as tensile strength, Young's modulus, and impact strength were enhanced by 24%, 16%, and 18%, respectively.

KEYWORDS: Reduced graphene oxide, epoxy, nanocomposites, mechanical properties.

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[PP146]

DETECTION AND REMOVAL OF LEAD BY USING MAGNETIC $CuFe_2O_4$ NANOPARTICLES AS AN EFFECTIVE ADSORBENT FROM AN AQUEOUS SOLUTION

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In the environment, both natural processes and human activities contribute to the presence of lead and its compounds. These compounds are extremely dangerous to different types of life. Lead can infiltrate the human body in two primary forms: inorganic lead and organic lead. Inorganic lead can amass in bones, soft tissues, and teeth, while organic lead, accumulates in the brain due to its affinity for fat [1]. Even trace amounts of lead can hinder the production of red blood cells, while surpassing recommended upper limits can lead to severe damage to the nerves, reproductive, and cardiovascular systems [2,3]. Given these risks, it becomes crucial to explore effective treatments that can mitigate the presence of lead ions around us, thereby averting lead toxicity. A magnetic solid phase extraction (MSPE) procedure for the removal and preconcentration of trace amounts of Pb (II) using the $CuFe_2O_4$ nanoparticles prior to their determination by flame atomic absorption spectrometry (FAAS) has been proposed. $CuFe_2O_4$ as solid-phase extraction adsorbent was synthesized via a co-precipitation and characterized by attenuated total reflection - infrared spectroscopy (ATR-IR) spectra, X-ray diffraction (XRD) spectrometry and scanning electron microscopy (SEM). These magnetic $CuFe_2O_4$ carrying the Pb (II) could be easily separated from the aqueous solution by applying an external magnetic field; no filtration or centrifugation was necessary. The influences of various analytical parameters such as pH, type and concentration of the eluent, amount of adsorbent, sample volume, adsorption, and desorption time, mixing type, and interfering ions on the recovery of Pb (II) by the sorbent were studied and optimized. The recovery values for Pb (II) under the presented optimum working conditions (pH 8.0, type and concentration of the eluent; 3.0 mL of 1.0 M of HNO_3, amount of adsorbent: 25 mg., and adsorption, and desorption time: 10 min.) were higher than 95% for removal and preconcentration.

KEYWORDS: $CuFe_2O_4$ nanoparticles, Flame atomic absorption spectrometry, lead, magnetic solid phase extraction, Preconcentration.

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[PP147]

PRODUCTION AND CHARACTERIZATION OF CLOVE OIL-ADDED POLYVINYL ALCOHOL/ CHITOSAN-BASED ANTIBACTERIAL NANOFIBERS BY ELECTROSPINNING METHOD

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The electrospinning method was used in nanofiber production. PVAC solution was prepared by mixing 8.0 % PVA and 2.0 % Chitosan solutions by weight at a 7:3 volume ratio [1]. These solutions with 2.0 % and 6.0 % clove oil added by volume were named PVACCO2 and PVACCO3, respectively. Chitosan(C), polyvinyl alcohol (PVA), and clove oil (CO) containing nanofibers were prepared by electrospinning. It became possible to produce 2.0 % and 6.0 % CO-doped nanofibers and homogeneous nanofibers with 6.0 % v/v content. The aim of this study is the electrospinning of clove oil doped nanofibers (PVAC-COs) of chitosan, a promising new bio-based raw material, and a synthetic polymer PVA; to investigate the effect of clove essential oil added to the mixture at different rates during the formation of nanofibers on viscosity, pH, conductivity, density, and surface tension properties. FTIR and TGA processing was performed to confirm the components in the nanofibers. Fourier transform infrared spectroscopy (FT-IR) provided profiles on the main functional groups of the nanofibers. The molecular structure of PVACCO nanofibers was investigated in detail by Fourier Transform Infrared Spectroscopy (FTIR), thermal behavior by Thermogravimetry (TG), morphology and structure properties, X-Ray Diffraction (XRD) and Field Emission Scanning Electron Microscopy (FESEM). The antimicrobial properties of nanofibers were determined using the AATCC 100 method [2]. The results proved that the clove paper additive in different proportions is essential to prepare the nanofibers.

KEYWORDS: Electrospinning, Nanofiber, Polyvinyl alcohol/Chitosan, Clove Oil, Characterization.

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[PP148]

DIRECT DETECTION OF PEROXIDE-TYPE ENERGETIC MATERIAL TATP BY NANOPARTICLE CATALYSIS

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Direct determination of triacetone triperoxide (TATP), which can be easily camouflaged using various substances (such as detergent and aspirin) and therefore widely used in terrorist activities, is very important. What makes TATP, a peroxide-based explosive, different from other explosives is that it does not have nitro groups or aromatic structure in its structure [1]. For this reason, it is very difficult to directly determine this explosive substance. The common feature of TATP studies is that TATP is decomposed with either an acidic cation-exchanger (such as Amberlyst–15) or a strong acid in solution, and indirectly determined through the degradation products formed. However, using acidic cation exchangers increases the cost of colorimetric analysis. With the addition of a strong acid for the degradation of TATP, the addition of a strong base is required to neutralize the excess acid. It is known that both strong acids and strong bases are highly corrosive and can be harmful to human health [2]. For this reason, it is important that TATP is degraded without the need for an external acid addition, and thus its direct determination can be performed. Therefore, in this study, a molecular spectroscopic sensor was developed based on the decomposition of TATP by hydrolysis without the addition of external acid, allowing the direct determination of TATP. In the developed method, acid is released as a result of the reaction of TATP with an amine salt, taking advantage of its solubility in acetone. Degradation of TATP by acidic hydrolysis occurs not with the addition of external acid but with the acid released as a result of the mentioned reaction. Hydrogen peroxide, released as a result of acidic hydrolysis, is decomposed into reactive oxygen species (especially hydroxyl radicals) by an amine-type reagent and nanoparticles. The produced hydroxyl radicals formed a colored cationic oxidation product from another amine-based reagent, and this colored product enabled spectrophotometric measurements in the solution phase. Under optimal experimental conditions, the linear calibration range was found to be 10 – 33 mg L^{-1} and the limit of detection (LOD) was 3.3 mg L^{-1}. In addition, in order to investigate the selectivity of the method, TATP and other explosive substances that were likely to be present, were applied as binary mixtures in the developed method to achieve acceptable recoveries of the analyte.

KEYWORDS: Molecular spectroscopic method, Peroxide based explosive, TATP detection, Colorimetric sensor.

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[PP149]

DUAL-FUNCTIONAL HETEROATOM-DOPED CARBON QUANTUM DOTS AND NANOCOMPOSITE FILM FOR HIGHLY SENSITIVE AND SELECTIVE DETERMINATION OF PICRIC ACID

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Picric acid (PA) has strong electron-withdrawing groups and is a dangerous nitroaromatic compound that is easily accessible. PA and picrates are also used in grenades, rocket warheads and minelayers [1]. Therefore, new methods need to be developed to detect PA sensitively and selectively in aqueous environments and soil. Current methods for determining PA are known to be expensive and involve problematic procedures for field use [2]. Compared to traditional detection methods, it is noteworthy that carbon quantum dots can be easily synthesized, have high quantum yield (QY) and low cost, have high surface area, photostability and fluorescence [3]. In this study, carbon quantum dots with a heteroatom-passivated surface (ON-CDs) were developed for the selective and sensitive determination of PA. ON-CDs were one-pot synthesized by the reflux method using citric acid, D-glucose, and ethylenediamine molecular precursors. The excitation and emission wavelengths of ON-CDs, which have a high quantum yield of 49.7% and an average particle size of 3.0 nm, are 355 nm and 455 nm, respectively. Analytical results show an excellent linear relationship in the PA concentration range from 1.0 to 11.0 nM for the emission intensity-based fluorometric method, with the limit of detection of PA being 12.5 pM. In addition to the ground state interaction, ON-CDs form an orange complex only in the presence of PA, allowing PA to be analyzed with the naked-eye. In the colorimetric method based on absorbance measurement, the detection limit of PA is 0.9 nM, with a linear relationship in the PA concentration range of 5.0 to 45.0 nM. Although ON-CDs respond only to PA among different explosives and their hydrolysates (*i.e.*, TNT, tetryl, RDX, HMX, NTO, PETN, and H_2O_2), they are not affected by the synthetically prepared matrix environment and can recover TNP in the range of 95.2% to 102.5%. Additionally, for practical application, a composite polymer film {PF(ON–CDs)} prepared with *poly*(vinyl alcohol) was produced and PA detection was minimized with a smartphone application.

KEYWORDS: Dual-mode nanosensor, picric acid detection, fluorescence quenching, PVA-based polymer film.

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[PP150]

THE ANAESTHETIC KETAMINE ANALYSIS WITH THE AID OF MODIFIED GOLD NANOPARTICLES

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An effective anaesthetic used in both human and animal surgical procedures is ketamine hydrochloride, sometimes known as “ketalar” [1]. Ketamine is currently not frequently utilized in human medicine for medicinal purposes, but it is used in animal healthcare and during trauma or emergency surgeries [2]. It is a drug that, when used in small amounts, has a rapid antidepressant effect resulting in decreased attention, poor learning capacity, or hallucinations [3]. The illegal use of ketamine has significantly increased recently, particularly among teenagers [4]. For this reason, the criminological evaluation of this drug is now very important. In the present study, we propose a rapid, simple, and plausibly selective ketamine colorimetric determination method based on melamine-modified gold nanoparticles (AuNPs@Mel). Melamine is a nitrogen-rich molecule and since it has three external amino substituents placed on the 1,3,5-triazine skeleton, it can replace the weakly held citrate groups present in the initially produced AuNPs with stronger coordination bonds. The basic idea of this study is that melamine functionalized on nanoparticles interacts with ketamine *via* intermolecular hydrogen bonds, leading to aggregation of AuNPs@Mel. With increasing ketamine concentrations, the surface plasmon resonance absorption intensity at around 520 nm decreased and a new absorption band appeared at about 650 nm. The analytical assessment was done by comparing the absorbance at 650 nm to that at 520 nm, and correlating to ketamine concentration. For ketamine concentrations ranging from 4.76 to 47.6 mg L^{-1}, the relationship between absorbance and concentration led to a linear calibration curve with a correlation coefficient of 0.9981 and a detection limit of 1.5 mg L^{-1}. The produced and functionalized AuNPs were characterized using Fourier-transform infrared spectroscopy, UV-vis spectrophotometry, and scan transmission electron microscopy. Additionally, the technique was successfully tested on fetal bovine serum as well as on complex solutions containing various common ions and potential camouflage materials. The statistical validity of this approach was established by confirming the agreement of results with those of previously reported LC-MS/MS method [5].

KEYWORDS: Ketamine determination, gold nanoparticles, melamine, colorimetric sensor, drug testing

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[PP151]

NEW ANALYTICAL APPROACHES BASED ON CATECHOLAMINES

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Electrochemical modification of an electrode entails a process in which the electrode undergoes electrochemical treatments to deposit specific chemical species on its surface. Such modifications are conducted to increase the sensitivity and specificity, reduce detection limits, enhance selectivity, or enable the analysis of electrochemically inactive compounds.

In the present work, a selected compound belonging to the catecholamine group was used as an electrode modifier. Such compounds are interesting for electrochemical analysis as a result of their unique structure. On the one hand, compounds possessing a quinone–hydroquinone system, like catecholamines, are electrochemically active [1,2]. On the other hand, due to the presence of the amino group, and therefore the available free electron pair, such compounds can form a covalent bond with the electrode surface, e.g. the glassy carbon electrode [1,3].

Bearing in mind the above-mentioned features of catecholamines, the aim of this study was to assess the suitability of a selected catecholamine as a modifier for the working electrode surface in voltammetry, and its subsequent usage for analytical purposes.

KEYWORDS: catecholamines, voltammetry, analytical chemistry, metal cations.

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[PP152]

SCHIFF BASE: SYNTHESIS FROM GLYCINE METHYL ESTER HYDROCHLORIDE, BIOLOGICAL ACTIVITY AND ANION SENSOR PROPERTIES

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Amino acids are highly important organic compounds containing both amino and carboxylic acid functional groups. Amino acids are classified as alpha (α-), beta (β-), gamma (γ-) or delta (δ-) according to the position of the core structural functional groups. The most important are α-amino acids, of which proteins are composed. Beyond their role as residues in proteins, amino acids are involved in a number of processes such as neurotransmitter transport and biosynthesis [1,2]. Glycine can be considered a polar amino acid. Its small size and the activity of its amino and carboxylate groups determine its solubility. However, the absence of any side chain gives glycine a unique flexibility among amino acids. In this study, glycine was preferred because it is not chiral. Schiff bases have been investigated for a wide range of biological activities including antimicrobial, antiviral and anticancer activity [3].

In the present study, an amino acid-based Schiff base, methyl 2-(5-bromo-2-hydroxy-3-methoxybenzylideneamino)acetate was synthesized from the reaction of glycine-methyl ester hydrochloride with 3-methoxy-5-bromosalicylaldehyde [4]. The structure of the compound was elucidated by elemental analysis, FTIR, UV-Vis and NMR spectroscopic methods. Antibacterial activity of the ligand, were investigated against various bacterial cultures by MIC method. DNA binding and DNA cleavage properties were also investigated by UV-Vis and gel electrophoresis. The compound binding electrostatically to calf thymus DNA (CT-DNA). Furthermore, DNA cleavage study showed that the compound cleaved DNA without the need for external agents. The colorimetric response of the Schiff base in DMSO to the addition of equivalent amount of anions (F^-, AcO^-, CN^-, OH^-, $H_2PO_4^-$, Br^-, I^-, SCN^-, ClO_4^-, HSO_4^- and N_3^-) was investigated. In this regard, while the addition of F^-, AcO^-, CN^- and OH^- anions into the solution containing the title compound resulted in a significant color change, the addition of Br^-, I^-, SCN^-, ClO_4^-, HSO_4^- and N_3^- anions resulted in no color change. According to these results, it can be said that the receptor compound shows sensor properties for F^-, AcO^-, CN^- and OH^- anions.

KEYWORDS: Schiff base, amino acid, sensor, biological activity.

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[PP153]

SENSITIVE REFLECTOMETRIC DETERMINATION OF DOPAMINE USING CUPRAC REAGENT-LOADED H-PTFE MEMBRANE

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Dopamine is a vital neuromodulatory molecule rendering its selective determination an important analytical challenge. Many optical and electrochemical methods have been used in sensing dopamine [1], but the determination of dopamine by spectrophotometric methods is limited because it does not contain a chromophore group. However, it is an *ortho*-dihydroxy catecholamine compound that can reduce the cupric-neocuproine complex ($[Cu(Nc)_2]^{2+}$) to the coloured cuprous-neocuproine chelate ($[Cu(Nc)_2]^{+}$). The CUPRAC reagent comprising cupric-neocuproine was initially developed in 2004 by Apak and colleagues [2] and found use in optical and electrochemical sensors beyond determining total antioxidant capacity. In this study, an optical reflectometric dopamine sensor design using a hydrophilic-polytetrafluoroethylene (H-PTFE) membrane was first performed. H-PTFE membranes loaded with Nafion (Nf) and CUPRAC reagent were utilized for optimization and analytical performance study. It was observed that a yellow $[Cu(Nc)_2]^{+}$ complex was formed on the H-PTFE membrane surface as a result of the reaction of dopamine with CUPRAC reagent, the intensity of the yellow colour increased with dopamine concentration. In the optimization studies, the amount of Nafion, the concentration of the CUPRAC reagent, and the colourimetric reaction times were optimized. H-PTFE membranes were immersed in 0.5% Nf solution (in ethanol) and CUPRAC solution (80 μL 0.2 M $CuCl_2$ (aqueous) + 160 μL 0.075 M Nc (in ethanol) + 1760 μL 1 M NH_4CH_3COO at pH: 7.0) for 10 minutes, respectively, and then dried at room temperature. The prepared Nf-CUPRAC−loaded H-PTFE membranes were immersed in a dopamine solution at varying concentrations, ensuring that the colour changes occurred on the H-PTFE membrane depended on the analyte concentration. Analysis of the results showed that the linear dynamic range was between 0.075 and 40.0 μM. The linear equation obtained from the calibration curve is $R\% = -7.882(\mu M) + 99.2$ ($R^2=0.9954$). The LOD and LOQ values were found to be 0.023 and 0.076 μM, respectively. Interference studies were conducted for ascorbic acid, uric acid, and glucose. It was observed that there was no interference at a 1:1 (dopamine: interfering analyte) ratio. Finally, a recovery study was performed by adding dopamine to artificial and real blood serum samples and recoveries close to 100% were achieved. Considering these results, the reflectometric sensor of dopamine was successfully realized utilizing the H-PTFE membrane.

KEYWORDS: CUPRAC reagent, dopamine, reflectometric sensors, H-PTFE membrane

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[PP154]

DEVELOPMENT OF A CHROMATOGRAPHY-BASED METHOD FOR ACCURATE AND RELIABLE ANALYSIS OF VITAMIN B12 IN FOOD SUPPLEMENTS

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Food supplements mean addition to the nutrients (nutrient content) in our diet. According to the Turkish Food Codex, nutritional support or supplementary foods are defined as "Nutritional elements such as vitamins, minerals, protein, carbohydrates, fatty acids, amino acids and fiber in order to support normal nutrition [1,2]. Vitamin B12, also known as cobalamin and containing cobalt (Co) in its structure, is a metal protein vitamin that is not synthesized in the human body and must be taken externally. Vitamin B12, unlike other water-soluble vitamins, cannot be synthesized by plants.

This study involves the development of an analytical method focusing on HPLC-DAD for vitamin B12 in food supplements. A new enrichment and detection method involving HPLC-DAD analysis after Magnetic Solid Phase Extraction (MSPE) was developed to monitor trace amounts of vitamin B12 for this and B12 molecule was analyzed by HPLC-DAD via isocratic elution 50% Methanol. After applying enrichment experiments to vitamin B12 solutions at different concentrations, it was determined that the studies changed linearly at 361 nm in order to determine the linear operating range. The linear working range for vitamin B12 was determined to be between 25-750 ng mL^{-1}. The limit of quantification(LOQ) was calculated for the B12 molecule under optimized conditions is 0.54 ng mL^{-1} by considering ICH guidelines. The limit of detection (LOD) was calculated for the B12 molecule 22.5 ng mL^{-1}. The accuracy of the method was tested with recovery tests and recoveries were obtained in the range of 95.7-104.9%.

KEYWORDS: Magnetic Solid Phase Extraction, Vitamin B12, HPLC-DAD, Food Supplements

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[PP155]

SIMPLE AND RAPID COLORIMETRIC SENSING OF DITHIOCARBAMATES BASED ON OXIDATION OF 3,3',5,5'-TETRAMETHYLBENZIDINE USING SILVER ION

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As a group of compounds containing disulfide substituents, dithiocarbamates (DTCs) have been used since the 1940s as pesticides in agriculture [1]. Depending on their chemical structures, DTCs can be divided into three major types: (i) dimethyldithiocarbamates, such as thiram and ferbam; (ii) ethylene-bis-dithiocarbamates, such as mancozeb and mitram; and (iii) propylene-bis-dithiocarbamates, such as propineb. Thiram (Tetramethylthiuram disulfide, TMTD) is a broad-spectrum fungicide that belongs to dithiocarbamates (DTCs) category. TMTD is a seed protectant and generally used as a pesticide in crops and vegetables. Its overuse can cause release into the environment, contamination of food and water, and ultimately dangerous effects on living organisms in various ways [2,3]. This situation reveals the necessity of developing simple approaches for the on-site and rapid determination of TMTD in agricultural products and the environment. Herein we presented a simple colorimetric approach for on-site sensing TMTD based on the silver ion (Ag^+) and 3,3',5,5'-tetramethylbenzidine (TMB) system. In this sensing system, Ag^+ oxidized TMB to the diimine form of TMB (TMB_{ox}), which displayed a visible colorimetric signal (as the TMB-TMB_{ox} charge-transfer complex) at approximately 650 nm. In the presence of increasing concentrations of TMTD, the absorbance of this charge-transfer complex notably decreased due to the strong coordinative interaction between Ag^+ and TMTD arising from the high affinity of thiol-disulfide ligands toward silver(I) ions. After appropriate reaction conditions (reagent concentration, pH, reaction time, *etc.*) were set, the proposed method was applied to TMTD solutions in the working range of 33.0 - 200 µM to obtain a linear analytical signal of the difference in absorbance (ΔA, where $\Delta A = A_{(blank,650\ nm)} - A_{(sample,650\ nm)}$) *versus* TMTD concentration. ($\Delta A = 860.61C_{TMTD} + 0.0289$, r= 0.9987). The approach described here is generally simple to use, does not require expensive equipment or sophisticated design, synthesis, or modification, and has a good detection limit, making it promising for quick on-site detection of TMTD.

KEYWORDS: 3,3',5,5'-tetramethylbenzidine (TMB), dithiocarbamates (DTCs) determination, silver ion, colorimetric method.

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[PP156]

CHEMOMETRIC STUDIES ON THE AROMA COMPOUNDS OF HONEY SAMPLES PRODUCED IN KAZAKHSTAN

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Honey is a nutritious food with economic importance for many countries worldwide. It is preferred due to their taste. Moreover, the aroma compounds, which are one of the parameters of honey quality, also indicate the honey's origin. The aroma compounds of honey also play an important role in detecting adulteration since honey volatiles play a major role in differentiating the types of honey based on their plant origin [1,2]. In general, honey is classified by the floral source of the nectar containing different pollens from which it was made. Although the pollen analyses classified the honey, the analyses are hard and give rude responses. In contrast, the qualitative and quantitative analyses of each aroma compound give information about the adulteration [3]. Besides the most frequent adulteration, the determination of the aroma compounds detection also indicates if the honey was heated or not. Thus, the analyses of aroma compounds provide consumers with more advantages.

The aroma compounds of sixteen honey samples, namely, 2 agrimonia, 3 buckwheat, 4 tamarix, and 7 sunflower honey samples collected from four different regions (Oskemen, Almaty, Kokshetau and Zhambul) of Kazakhstan were analyzed using Headspace GC-MS. In total, 77 aroma compounds were detected and 74 of them were identified. The identification percentages were more than 95%. The main compounds were selected for the chemometric analyses using Minitab 17.0 software. The score and the loading graphs of principal component analyses were well performed. Agrimonia, buckwheat, tamarix, and sunflower honey samples differentiated according to the score graph of aroma compounds. Dehydro-*p*-cymene, β-linalool, 2-nonen-1-ol, and linalool oxide were dominant compounds for agrimonia honey while nonanol, benzaldehyde, octanol, dehydro-*p*-cymene and β-linalool for buckwheat honey, and β-citral, lilac aldehyde A, limonene, β-damascenone, linalool oxide for tamarix honey, and hotrienol, cosmene, α-pinene, carvacrol for sunflower honey.

KEYWORDS: Aroma compounds, Headspace-GC/MS, Principle Component Analysis, Chemometry, Monofloral Honey

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[PP157]

THE CHEMICAL PROFILE OF 15 TURKISH PROPOLIS WITH CHEMOMETRIC APPROACH

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Propolis is a natural substance collected by honey bees from the environment. It is collected from various plants such as poplar, palm, pine, conifer secretions, gums, resins, mucilage, and leaf buds. The typical composition of raw propolis is 50% plant resins, 30% waxes, 10% essential and aromatic oils, and other organic compounds. Scientists focused on propolis chemistry and its bioactivities in the last two decades. The literature revealed that propolis is useful and can be used to prevent and treat colds. It has also been reported that propolis has diverse bioactivities including anti-inflammatory, antimicrobial, antioxidant, antitumor, antiulcer, and anti-HIV activities. Therefore, it is suggested to use it against wounds and ulcers, rheumatism, sprains, heart disease, diabetes, and dental caries. Modern medical treatments have recently suggested propolis usage due to its well-investigated chemical composition. Until 2000, over 300 chemical components belonging to the flavonoids, terpenes, and phenolics have been identified in propolis [1].

The Turkish propolis samples collected from 15 different regions were extracted using 95% ethanol. After drying, the extracts were analyzed for their chemical ingredients using HPLC-DAD coupled with a C_{18} (5 µm, 4.6 mm x 250 mm) column [2]. The principal component analysis (PCA) was applied to the results of propolis samples. According to the HPLC, naringenin (ranged from 10.64 to 103.89 mg/g), chrysin (ranged from 0.88 and 42.97 mg/g), caffeic acid (ranged from 1.81 and 14.33 mg/g), ferulic acid (ranged from 0.1 and 11.33 mg/g), and cynarin (ranged from 6.44 and 16.61 mg/g) were in good amounts. Other compounds, such as vanillin, vanillic acid, apigenin, *p*-coumaric acid, kaempferol, luteolin, *p*-hydroxybenzoic acid, *trans*-2-hydroxycinnamic acid, pyrocatechol, *trans*-cinnamic acid, and propyl gallate were also quantified. The PCA indicated the difference between the regions where propolis samples are produced. The caffeic acid, cynarin, chrysin, *p*-hydroxyresorcinol, kaempferol, and apigenin play important role in the identification of fingerprinting compounds for the samples collected from Bayburt, Karabük, Ardahan, and Elazığ.

KEYWORDS: Propolis, flavonoid, phenolic compounds, HPLC-DAD.

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[PP158]

INVESTIGATION OF THE EFFECT OF *Cichorium intybus* L. TO PREVENT OXIDATIVE DNA BASE DAMAGE

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Oxidative stress results from the lack of cellular balance between the pro-oxidant and the antioxidant species. Sustained attack of endogenous and exogenous ROS results in conformational and oxidative alterations in key biomolecules [1]. DNA damage, one of these biomolecules, can cause cell death, mutation, and various diseases. However, antioxidants produced naturally in situ or externally given by food or herbal supplements can regular this process [2]. In recent years, there has been a lot of interest in finding alternative, natural, and secure sources of food antioxidants, particularly those with a plant origin. *Cichorium intybus* L., known as white chicory, belongs to the *Asteraceae* family and is widely found in India, Northern and Southern Europe and Turkey. Numerous parts of the plant have been used in traditional medicines all over the world due to its wide distribution. In Turkish folk medicine, both its roots and leaves are used for various purposes [3].

In our previous study, the ultrasonic-assisted extraction conditions of antioxidant substances from white chicory were optimized by central composite design-response surface methodology [4]. In this study, phenolic substances contained in the extract prepared under optimum conditions were determined quantitatively by HPLC. The phenolic compounds in white chicory extract were identified. The ones found in the highest amount are procyanidin B-2, procyanidin A-2, and rosmarinic acid. Calf thymus DNA was subjected to Fenton reaction with and without extract. White chicory extract was added in three different doses. The damage caused to DNA bases by the Fenton reaction was determined by quantitative analysis of DNA base damage products. The amount of protection of the bases in the DNA structure of each sample obtained against oxidative damage was determined by simultaneous quantitative determination of DNA base damage products by GC-MS/MS. It was determined that oxidative damage to DNA bases by the Fenton reaction was reduced when the extract was added.

KEYWORDS: Antioxidant, C*ichorium intybus* L., DNA, GC-MS/MS, oxidative damage

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[PP159]

QUAINOLINE BASED FLUORESCENCE AND COLORIMETRIC SENSOR FOR SEQUENTIAL DETECTION OF COPPER (II) AND N-ACETYL-L-CYSTEINE

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Thiol-containing drugs are commonly utilized for the therapy of several diseases. As one of these drugs, N-acetylcysteine (NAC) was prefer as a mucolytic agent for the cure of chronic bronchitis and diseases caused by oxidative damage and free radical production. Some methods have been used for the detection of NAC, such as chromatography, electrophoresis, mass spectrometry, electrochemistry, etc. However, these techniques showed disadvantages including low detection efficiency and complex operation. Therefore, it is significant to develop a simple, rapid and low-cost method for NAC [1,2,3]. In this study, quoline-based sensor ((E)-1-((8-hydroxyquinolin-2-yl)methylene)-3-methylurea, QMEH) was designed and synthesized to obtain sequential determination of Cu^{2+} and N-acetyl-L-cysteine (NAC). Probe QMEH showed excellent monitoring potential for the fluorescence determination of Cu^{2+} and NAC. Upon addition of Cu^{2+} to probe QMEH, a decrease in fluorescence signal at 525 nm of sensor was detected that was known to the presence of -C=S in the chemical structure of QMEH. Upon interaction with Cu^{2+}, the decrease in emission of probe QMEH was determined through fluorescence quenching mechanism. In addition, QMEH-Cu^{2+} complex was used for the determination of NAC. The obtained data showed that the stronger interaction of NAC with Cu^{2+} was detected compared than QMEH-Cu^{2+} complex. After the formation of NAC-Cu^{2+} complex and subsequently probe QMEH was released from QMEH-Cu^{2+}. Also, QMEH can be used as a colorimetric sensor for the sequential determination of Cu^{2+} and NAC. Furthermore, cytotoxicity was evaluated and bio-imaging studies were carried out to prove that the sensor works inside the cell.

KEYWORDS: Acetyl-L-cysteine, fluorescence Sensor, copper, cytotoxicity, cell imaging

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[PP160]

SYNTHESIS AND PHOTOISOMERIZATION STUDIES OF THE CONDUCTING POLYMER THIN FILM OBTAINED BY SYMMETRIC ELECTROACTIVE AZOBENZENE COMPOUND

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Conducting polymers has immense potential in the fields of sustainable and flexible electronics, smart materials, drug delivery devices, corrosion-resistant coatings, and biosensing applications [1]. Among the types of conductive polymers, redox and photosensitive materials are promising materials due to their fast and efficient response behavior. By combining carbazole and azobenzene, redox and photosensitive materials containing the outstanding properties of both carbazole and azobenzene can be prepared.

In this study, the photosensitive monomer F1(bis(2-(9H-carbazol-9-yl)ethyl) 4,4'-(diazene-1,2-diyl)dibenzoate) was synthesized by the reaction of the electroactive carbazole groups and photoactive azobenzene derivative. Electrochemical polymerization of the F1 was conducted in a three-electrode cell setup on the ITO (Indium Tin Oxide coated glass) working electrode with CV (Cyclic Voltammetry) technique ranging from 0.3 to 1.5 V. Electrochemical and optical properties of the obtained conducting polymer (PF1) were investigated. Spectroelectrochemical techniques were used to determine the band gap energies of the π-π* transitions of the PF1. The redox colors of PF1 were investigated. The differences of PF1 surface morphology resulting from the redox reaction at different potential values was investigated by AFM (Atomic Force Microscopy), SEM (Scanning Electron Microscope) analysis, and contact angle measurements.

KEYWORDS: Azobenzene, Carbazole, Functional Polymer, Electrochromic Materials.

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[PP161]

SYNTHESIS OF “THREE-IN-ONE" s-TRIAZINE CORED MONOMER: ELECTRICAL, OPTICAL AND GLUCOSE SENSING PROPERTIES

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With recent advances in sensing technologies, the structural architecture of organic compounds has become increasingly popular. In this context, numerous scientific research groups have focused on the synthesis of multifunctional monomers for the design of conjugated polymer-based electrochemical biosensors. Among the available conductive polymers, carbazole-based polymers are one of the most used materials in biosensor studies due to their extraordinary chemical, electrical, and structural characteristics [1-2].

Herein, we highlight the design and synthesis of a “three-in-one” s- triazine-cored monomer consisting of electroactive, functional, and fluorescent groups. The 4-((9H-carbazol-2-yl)oxy)-6-hydrazineyl-N-(pyren-1-ylmethyl)-1,3,5-triazin-2-amine monomer (coded as TPCH) was electrochemically polymerized on an indium tin oxide (ITO)-coated glass electrode using the cyclic voltammetry (CV) method. The electrochemical, optical, and morphological properties of obtained polymer film were investigated in detail. The monomer with carbazole as a transducer, hydrazine as an enzyme crosslinker group, and pyrene amine as an π-conjugated pendant group can be considered an excellent sensing system for biosensor applications. In this context, the conductive polymer-based amperometric biosensor for glucose sensing was constructed. This platform was obtained by immobilizing glucose oxidase (GOx) onto the polymer-modified graphite electrode surface and glutaraldehyde (GA) as the cross-linker. The surface of each modified electrode was characterized by CV and scanning electron microscopy (SEM) techniques. Moreover, the fabricated biosensor exhibited high stability, affinity, sensitivity, selectivity, and reproducibility. We hope that the system developed in the light of the data obtained can provide a rational perspective for novel amperometric biosensor applications.

KEYWORDS: s-triazine, carbazole, conductive polymer, amperometric biosensor.

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[PP162]

INVESTIGATION OF THE EFFECT OF NATURAL ANTIOXIDANT ADDITIVES IN PVC PROFILE PRODUCTION

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Low-carbon living has been gaining increasing popularity in recent years. Nonrenewable energy resources are rapidly depleting. This situation demonstrates the need for sources of renewable energy. The world's energy shortage is a major issue. Only about 20% of the world's forest waste is used. Lignocellulosic biomass (grass, hardwood, softwood, and so on) has enormous potential to provide new resources to alleviate energy scarcity [1]. However, lignocellulose is composed of three primary components: cellulose, hemicellulose, and lignin, all of which have benefits beyond energy generation [2]. Furthermore, they have the potential to be used as additives in different processes. Polyvinyl chloride (PVC) is the main ingredient in PVC profile production. Some additives are also used during production to improve PVC profile properties. Stabilizers are one of the raw materials used as additives in PVC profile production. Lignin from plant sources can act as a heat stabilizer in the production of PVC profiles. Calcite ($CaCO_3$) is used in the production of PVC profiles to keep the profile more stable; lignin can help calcite function, making it more functional [1]. One of the important sources of lignin is pine cones. The black pine, or *Pinus nigra*, is a somewhat varied species of pine that grows throughout Southern Europe, from the Iberian Peninsula to the eastern Mediterranean, on the Anatolia, as well as in the Crimea and the Northwest Africa. The adult cones, which measure 5 to 10 cm in length and have rounded scales, are a significant source of lignin [3].

In this study, lignin was extracted from *Pinus nigra* cone. Extraction was carried out using a magnetic stirrer at 80 ^{o}C for 8 hours. A mixture of 80% formic acid, 0.2% HCl, and 5% methanol was used as the solvent. The prepared extract was concentrated 10-fold using a rotary evaporator. The concentrated extract was added to the brown and anthracite PVC profile process at the production stage. The effect of the extract was evaluated by color and stability tests of the obtained profiles.

KEYWORDS: Antioxidant, lignin extraction, PVC profile, stabilizer, *Pinus nigra*

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[PP163]

PRODUCTION OF GRAPHENE BASED POLYMERIC ADSORBENT AND REMOVAL OF DYES FROM WASTEWATERS

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The importance and usage area of polymeric nanocomposite-based materials has recently increased considerably among composite materials of various structures. In this study, nanocomposite materials with polyvinyl alcohol (PVA) matrix were produced by using graphene oxide (GO) synthesized by Hummers' method. "In the production of composite materials, polymers, especially polymers in thermoplastic structure, are used rather than metals and ceramics as matrix" [1]. "The fact that polymers can be processed easily, have a flexible structure and low density is thought to be the reason for this situation" [2]. For this reason, it is aimed to form a polymeric absorbent by adding sodium silicate to the structure for gel formation. In this study, pre-prepared GO with Hummers' method was used for adsorbent synthesis. GO, which was homogenized in an ultrasonic bath and adjusted to 1% by mass, was added into 50 ml of 5% by mass PVA solution (95°C). Then, 10 mL of sodium silicate was slowly added to the solution to form gelation and kept in a mixer at 95°C for 1 hour. At the end of the waiting, the material was taken as hot and put in an ultrasonic bath for 1 hour, the entire gel, which was expected to cool, was taken to the synthesis reactor, kept at 200°C for 3 hours, and left to cool. The surface area was increased by grinding the resulting material. pH, time, temperature, and dosage parameters were selected for optimization studies, and after the experiments, the highest efficiency was obtained for pH 4 in pH studies (pH: 2-4-6-8-10), 30 minutes in time studies (t: 5 min-10 min-30 min-90 min), temperature studies (T: 35°C-45°C-55°C-65°C) at 35°C, and finally dosage studies (m: 25 mg-50 mg - 75 mg-100 mg- 125 mg) for 100 mg. Rhodamin B, frequently used in adsorption-based dye removal studies and preferred in absorption kinetics studies was chosen as the model compound. Each parameter study was carried out in 3 repetitions and 97% removal was obtained when optimum conditions were met. The samples were filtered to contain 10 mL and 10 ppm Rhodamin B, and the experiments were carried out with the absorbance measurements in the spectrophotometer at 550 nm and the measurements of the model compound.

KEYWORDS: Adsorbent, Dye, Wastewater, Synthesis, Polymer.

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[PP164]

MIPS & APTAMERS: SYNERGISTIC EFFECT FOR THE ULTRASENSITIVE DETERMINATION OF LEPTIN USING NANOMATERIALS-BASED VOLTAMMETRIC SENSOR

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The precise and sensitive detection of macromolecules remains crucial for diagnosing diseases and safeguarding human health [1,2]. In this sensor, we developed a hybrid electrochemical sensor incorporating two recognition elements, namely aptamers (Apt) and molecularly imprinted polymers (MIPs), for highly sensitive detection of Leptin. Initially, the sensor design was started by modifying the surface of a screen-printed electrode (SPE) with platinum nanospheres (Pt NSs) and gold nanoparticles (Au NPs). This modification enabled the Apt[Leptin] complex to be successfully immobilized to the surface. Subsequently, we created a polymer layer around the complex by electropolymerizing orthophenilendiamine (*o*PD), which enhanced the retention of Apt molecules on the surface. Consequently, a synergistic effect emerged between MIP cavities formed by the surface removal of Leptin and trapped Apt molecules, resulting in the ultrasensitive performance of a hybrid sensor. [3]. To determine the best performance of the sensor, pH of the electropolymerization solution, the ratio of *o*PD and Leptin, the number of polymerization cycles for polymer coating, the application time of the removal solution and the rebinding time of Leptin were optimized. Under optimum experimental conditions, the changes observed in the currents during differential pulse voltammetry (DPV) showed a linear response over an increasing concentration range, starting from 1.0 fg/mL and up to 10.0 pg/mL. Notably, the limit of detection (LOD) for Leptin detection was an impressive 0.31 fg/mL. Furthermore, we assessed the hybrid sensor's applicability by testing it with actual samples, including human serum and plasma. The results good recovery percentages, ranging from 106.2% to 109.0%.

KEYWORDS: Aptamer, Gold nanoparticles, Leptin, MIPs, Platinum nanospheres

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[PP165]

ANTI-PROLIFERATIVE EFFECTS OF NEW BORON COMPOUNDS

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Benign prostatic hyperplasia (BPH) is the most common benign adenoma in men and histologically characterized by the proliferation of prostatic epithelial and stromal cells. Approximately 40% of men have the risk of developing this disease throughout their lives. Generally, BPH occurs due to complex cellular changes which include alterations in proliferation, differentiation, apoptosis and senescence. However, data evaluating the clinical responses of anti-proliferative therapy for BPH are quite limited [1]. Boron (B) is not find elementary form in nature and when boron enters the organism it was represented by boric acid $B(OH)_3$ and quite small amount of borate anions $B(OH)_4$ in the blood and tissues [2-3]. It was thought that boron and its derivatives could be used as potential treatment of diseases that were characterized by chronic inflammation and cell proliferation such as BPH because of anti-inflammatory and immune response regulatory properties. In this study, the capacity of new boron compounds to inhibit BPH cell growth was investigated. Boron and its derivatives have high water solubility in general. This makes it difficult to pass through the cell membrane and reduces the effectiveness of boron compounds. Therefore, boron-amine compounds were first synthesized by our group, and alkyl groups were used to increase the oil solubility and hydrophobic effect that would enable the compound to pass through the cell membrane easily. A total of 8* new boron compounds were synthesized, their structures were elucidated by elemental analysis, ^1H and ^{13}C NMR spectroscopy and patented. Then, MTT analyzes were performed to determine the cytotoxic or anti-proliferative effects depending on the treatment times and doses of the compounds in BPH-1 cell line. As a result of the first studies, it was observed that boron compounds inhibited cell proliferation with different effectiveness. According to the IC_{50} values obtained with GraphPad software, compounds M2 and M7 were determined to have the highest anti-proliferative effect. Furthermore, in order to increase the effects of these compounds, new ones (M2m and M7m) were synthesized by making different modifications. Consequently, it was determined that M7m had the lowest IC_{50} values compared to other compounds and that the modification made a significant difference in terms of cytotoxic activity. Eventually, it is concluded that new synthesized boron compounds may have anti-proliferative effects and may offer an important therapy option for the treatment of diseases such as BPH, which are characterized by excessive cell proliferation.

KEYWORDS: Benign prostatic hyperplasia (BPH), Boron compounds, Anti-proliferative, NMR

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