Enviro Chem

3. INTERNATIONAL ENVIRONMENTAL CHEMISTRY CONGRESS

01-04 November 2021 Kemer ANTALYA

ABSTRACTS AND PROCEEDINGS E-BOOK

FOREWORD

3rd International Environmental Chemistry (EnviroChem) Congress

We are proud to organize our third congress by the Turkish Chemists Society under the title of Environmental Chemistry. As will be remembered, we organized our first congress with the title of 1st Eurasian Environmental Chemistry Congress in 2018 and our second congress with the title of 2nd International Environmental Chemistry Congress in 2019. This year, the third of our congress was held under the title of 3rd International Environmental Chemistry Congress (EnviroChem).

This congress was organised by Erciyes University, Karadeniz Technical University and Muğla Sıtkı Koçman University. The main purpose of this congress was to establish a warm environment to share cutting-edge information on developments in all areas of environmental chemistry research. The congress aims to bring together researchers from the entire spectrum of the multi-disciplinary fields of environmental chemistry and establish effective means of communication between them. This year we had participants from Algeria, Azerbaijan, France, Germany, Iran, Kosovo, Morocco, Russia, Nigeria, Palestinian, Pakistan, Tatarstan, Turkey, Tunisia, Ukraine, UK and USA. Eight invited speakers and more than 120 researchers presented their research work as oral/poster presentations.

On behalf of the organizing committee, we would like to thank you all for joining us and contributing to the success of the EnviroChem 2021. As an integral and significant part of this conference, your attendance added tremendous value. We also greatly acknowledge Ness İletişim, SEM, Terra, Redoks, ChromaScience and Naz Laboratuvar for their very generous sponsorships and supports in the organisation of 3rd International Environmental Chemistry Congress (EnviroChem).

Last but not the least we greatly appreciate the contributions of the local Organizing Committee who have spent their energy on the success of this congress. We want to thank Mirage Park Resort (Göynük, Kemer, Antalya/Turkey) for their excellent services.

Best wishes.

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November 2021

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Circular Economy Approach in Environmental Pollution Control: Water, Chemical and Energy Recycling

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Recycling practices in the world are not new and date back to ancient times. However, modern recycling applications started after the 1960s. In the 1960s, modern recycling applications started with the developments in treatment technologies. Limitations in water recovery are heavy metals, antibiotics and resistance formation, hormones and micropollutants. With climate change and reductions in water resources water reuse is getting more importance. Wastewater is a source of nitrogen, phosphorus, rare earth elements and boron. According to type of wastewater different types of chemicals can be recycled from wastewaters. Energy efficiency has become important in treatment plants. The transfer of organic load to anaerobic sludge digesters, the application of intermittent aeration controlled by on-site ammonia measurements, the high efficiency gas energy generation system, the energy saving provided by separate treatment of the sludge digester liquid (side flow) and the increase in biogas production in digesters with sludge disintegration are the factors that increase energy efficiency. It is important to choose the appropriate treatment technologies for recycling activities and at this point, membrane technologies have played an important role in recent years. Along with water, chemical and energy recovery, word preferences have also gained importance. Wastewater has become a source of water, chemicals, and power supply. Additionally, treatment facilities have turned into water, chemical and energy production facilities. The Environmental Engineering discipline is shifting towards technologies that provide resource recycling alongside conventional treatment methods. Resource-generating processes such as water recovery, recovery of chemicals and rare elements, minimum energy consumption and maximum energy production have gained importance and become indispensable. In this direction, it is important to research, develop and apply new technologies and processes. Education programs should be revised accordingly.

IS – 2

District Metered Area Method and Cost-Benefit Analysis in Water Distribution Systems

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Urban water management is a quite complex and dynamic process that includes a lot of components. Therefore, a manageable system should be established and monitored regularly for a sustainable urban water management. It is very important to regularly monitor and analyze the most basic parameters which are the system inlet flow, pressure, failure rates and leakage volume, network physical and customer characteristics. In this study, the importance, advantages, and benefits of the district metered area (DMA) approach in urban water management are presented and discussed. For this purpose, the principles of the DMA method, design criteria, field works, and necessary equipment are detailed. Then, the DMAs with two different approaches were applied in the field and compared. These approaches are basically; (i) the creation of DMA with using only isolation valves (ii) the creation of isolated zones by renewing the network and its connections. The costs (design, site implementations, labor) and benefits (the amount of water saved, and the volume of leakage prevented) resulting from the implementation of both approaches are analyzed. For this purpose, an application was carried out in the service area of Kayseri Water and Sewerage Administration (KASKİ). It is thought that the results obtained from this study will constitute a reference especially for practitioners and decision makers within the scope of isolated zone design and implementation.

IS – 3

Optimized Lab-based and Field Environmental Analysis Using Direct Mass Spectrometry

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Conventional methods for the analysis of trace volatile organic compounds (VOC) in air, soil, and water usually involve significant sample preparation followed by timely chromatographic analysis. Direct mass spectrometry (DMS) provides opportunities for simplification – or even elimination – of sample preparation, plus real-time onsite analysis or high-throughput lab analysis. SIFT-MS (Selected Ion Flow Tube - Mass Spectrometry) is a DMS technique that provides highly sensitive and selective analysis of a wide range of compounds by applying various switchable soft chemical ionization (CI) reagents. Diverse VOC such as benzene, toluene and formaldehyde as well as inorganic gases such as sulfur dioxide and hydrogen sulfide are detected in a direct, single analysis.

Various environmental applications of SIFT-MS will be discussed, ranging from real-time ambient air monitoring to high-throughput water and soil analysis.

SIFT-MS utilizes precisely controlled chemical ionization reactions to detect and quantify trace amounts of VOC. Analysis occurs in real-time and with typical LOD in the sub-ppb range. Positive or negative reagent ions are generated when a microwave is discharged through moist air. Selection of the individual reagent ion is performed with an upstream quadrupole, following controlled ion-molecule reactions with the sample gas in the flow tube chamber. The mass analysis of the product and remaining reagent ions is done in a downstream quadrupole. Software processes the ion counts, together with instrumental parameters, to calculate absolute concentrations of the target compounds.

Field studies will be presented where SIFT-MS was applied for the mobile analysis of VOC in air directly on the site of plants, public traffic or areas like gas stations or convenient stores. Those were performed in public areas in Korea and New Zealand.

As well, the technology can be used in high-throughput lab analysis. A study will be discussed that was applied to quantify possible odor-causing chemical species at a large New Zealand wastewater treatment plant (WWTP). Results are discussed and correlated in terms of chemical compositions determined by SIFT-MS and by conventional olfactometry.

IS – 4

Recent Advances and New Topics in Advanced Oxidation Processes (AOPs)

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Advanced oxidation processes (AOPs) were first proposed in the 1980s for drinking water treatment and later were widely studied for the treatment of different wastewaters. The environmental applications of AOPs also include air pollution abatement and soil remediation. However, AOPs have increasingly been utilized as water and wastewater treatment technologies. Generally, AOPs are based on the in-situ generation of a powerful oxidizing agent, such as hydroxyl radicals ($^{\bullet}OH$) or sulfate radicals ($SO_4^{\bullet-}$), to degrade recalcitrant, toxic, and non-biodegradable compounds to smaller by-products and eventually to inert end-products. AOPs often are classified into chemical, photochemical, sonochemical, and electrochemical approaches. In this article, the global status of publications and researchers' attention to various methods of AOPs around the world will be presented. Also, novel topics and challenges in the field of AOPs that researchers have considered in recent years will be introduced.

IS – 5

DNA Damage Detection: Metal Ion/H_2O_2 Induced Damage and DNA-Anticancer Drug Interactions

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Deoxyribonucleic acid (DNA) is one of the important biomolecules of the life process since it carries genetic instructions in all known organisms and many viruses. It plays a vital role in encoding information, replication, gene expression and mutation-recombination. DNA can undergo chemical or structural changes when it is exposed to physical or chemical factors. These changes lead to DNA damage which might result in serious health problems such as cancer and mental disorders.[1,2] Therefore, development of efficient and reliable techniques to detect the damage are vital. Electrochemical DNA-based methodologies including DNA damage and protection (repair) have been very valuable since the use of these methodologies facilitate the elimination of laborious, expensive, and complex protocols. Within this framework, most commonly, changes for DNA bases, DNA products or DNA related indicators are followed with good sensitivity and excellent practicability. Different types of damage factors including oxidizing agents, alkylating agents, ultraviolet light, or X-rays can cause base mismatches, double-strand breaks, toxicity and mutations. The resulting damage is successfully and directly determined by electroanalytical techniques.[3,4]

The invention of nanotechnology has been one of the most important milestones in electrochemical sensors. Nanomaterials including carbon nanotubes, graphene, nanoparticles, nanowires, and nanostructured polymers are widely used in these studies owing to their magnificent chemical, mechanical, electrical, structural, optical, and thermal properties.[5,6] Taking this remarkable advancement, this talk will be focusing on recent developments in the field of DNA damage nanobiosensing. Particular attention will be given to electrochemical nanosensors developed for metal ion (Fe^{2+} or Cu^{2+})/hydrogen peroxide (H_2O_2) induced damage and DNA-anticancer drug interactions. Technical challenges and prospects for the topic will be outlined.

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IS – 6

Microfluidic Chips in Sample Extraction for Preconcentration, Clean up and Easy Detection of the Analytes

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Over the decades, the community of analytical chemists have made a significant effort to make the analytical procedures much easier, precise, and cost-effective. Miniaturization of analytical methods and instruments for extraction research is an area of burgeoning interest.[1] More recently, the advent of microfluidics and total analysis systems (TAS) has revolutionized the way that the analytical procedures are carried out through the integration of multiple steps of a typical assay in a low-cost and miniaturized manner.[2] Based on a definition, microfluidics refers to the science of exploitation and manipulation of small amount of liquids within defined microchannels which comes with remarkable characteristic such as reduced amount of reagents and samples, high resolution separations, short analysis time, control over the concentration of species in space and time, and the possibility to fabricate integrated analytical devices over small footprints.

Sample preparation is implemented for variety of purposes such as concentrating the analyte, reducing the matrix effect, removing the interferences, converting the sample to a form compatible with the final analysis method, and ensuring reliable and precise measurements.[3] Among the present sample preparation modules, sample extraction techniques have been at the centre of attention due to their remarkable features such as outstanding preconcentration and sample clean-up. Interestingly, several fascinating chip platforms have also been introduced for each of the extraction methods to improve the conventional operation procedures.

Herein, we will provide a comprehensive overview on exploitation of chip devices in sample extraction covering all aspects of design, fabrication, operation, and different extraction methods. Chip devices applications in miniaturized sample preparations like as three phase liquid phase micro extraction,[4] electromembrane extraction[5] and direct analysis of some important analytes in complex matrices such as environmental samples and biological fluids will be discussed. Moreover, a discussion on how implementation of chip technology can improve the operation procedure and efficiency of each extraction method is provided at various sections of this review. Also, its potentials and limitations and future view will be investigated.

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IS – 7

Water-Based Chemical Mining for Environmental and Public Health Assessment

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A new approach utilizing urban water-based chemical mining with hyphenated mass spectrometry techniques has been recently pioneered to provide near real-time measurements of public health. Water-based chemical mining provides anonymized but comprehensive and objective information on the health status of a population and surrounding environment in real time as urban water (sewerage system and receiving aqueous environment) pools the endo- and exogenous biomarkers of that population.

This cutting-edge approach of extracting epidemiological information from urban water is also known as Wastewater-Based Epidemiology (WBE). This talk will introduce the concept and its rapid advances. It will focus on pharmacologically active compounds and endocrine disruptors in urban water and their stereochemistry in the context of environmental risk assessment. It will also explore new avenues in the utilization of urban water fingerprinting in the assessment of population health and health risk prediction.

IS – 8

Rapid Water Quality Monitoring in a Pandemic and Climate Change Impacted World: Current Technology and Global Applications

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Our water resources today are impacted by human activities and climate change. These are complex systems that include decaying engineering structures and multiple land use patterns. Wastewater remains a primary source of contaminants in water, including waterborne pathogens and chemical hazards. The current guidelines that describe water safety by targeting fecal indicator bacteria does not provide the resolution needed for hazard and source characterization or management decisions that need to be made with limited resources. Recent advances in molecular techniques create a suite of techniques that enable monitoring water quality in real time, tracking the sources of high levels of human-associated contaminants, and surveilling community spread of emerging viruses that cause pandemics such as COVID-19. This presentation will focus on the use of rapid molecular techniques in water resource management and emergency response at different parts of the world and how to engage stakeholders with these new tools to improve and harmonize health-related water indicator targets globally.

OP – 1

Electrochemical Determination of Copper (II) Ions by Using Rhodamine Based Dye

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Copper is the third most abundant element on earth and has some pivotal features such as maintenance and growth of brain tissues, heart and kidney and red blood cell production. It is also found in the structure of some metallo-enzymes.[1] The excess of copper is toxic and its amount in drinking water is undesirable to exceed 20 µM.[2] Therefore, copper(II) ion determination is very important and the main purpose of this study is to develop a simple, inexpensive and disposable electrode material contrary to the voltammetric methods for the determination of copper(II) ions in the literature.[3,4] Moreover, it was aimed to develop a highly-sensitive and accurate method for the determination of copper (II) ions.

The cathodic peak belongs to the synthesized rhodamine based dye[1] at -520 mV decreases with the increasing amounts of copper(II) ion. This signal change was used for the voltammetric determination of copper(II) ions.

A novel, simple, inexpensive and highly sensitive voltammetric method of determining copper(II) ions is proposed as an alternative to the methods in the literature. The developed method does not need any additional operations such as preparation and modification of the electrode material since the disposable screen-printed electrode is used, and therefore has a prominent advantage.

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OP – 2

Hydrocarbonoclactic Bacteria Isolated from Oil-polluted Soil Degrade Long-Chain Alkanes Through Biofilm Formation

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In order to get insight to the mechanism of hydrocarbons degradation in soil, three bacteria, *Novosphingobium* sp., *Gordonia amicalis* and *Gordonia terrae,* isolated from a crude oil polluted soil by enrichment were chosen for their ability to grow on alkanes. The hydrophobic substrates used for the study were alkanes: hexadecane and paraffin, a wax ester: hexadecyl hexadecanoate and a triglyceride: tristearin. Planktonic growth was determined by measuring optical density (OD) of cultures at 600 nm while biofilm formation was assessed using crystal violet biofilm assay. To compare planktonic and biofilm growths, the relationship between crystal violet coloration and OD 600 nm was established for each strain. Structure of the biofilms was determined with fluorescence microscope equipped with Apotome, allowing for optical sectioning. In addition, biodegradation of hexadecane was monitored using differential analytical analysis: disappearance of hexadecane was monitored by GC-FID, and LC-MS/MS analyzed the appearance of metabolites unique to hexadecane degradation. Results showed that *Novosphingobium* sp. grew only on hexadecane without forming a biofilm. Likewise, *Gordonia amicalis* grew on hexadecane in planktonic state but formed biofilm on wax ester, with no growth on paraffin. In contrast, *Gordonia terrae* exhibited significant biofilm formation on hexadecane, paraffin, and wax ester with nearly no planktonic growth. Microscopic characterization of the biofilm formed by *Gordonia terrae* on paraffin revealed spatial structures and high cell densities that covered the available surface even at 24 h. However, biofilm formed on wax ester was patchy with cells adhering to each other and the substrate. Furthermore, GC-FID analysis showed the disappearance of more than 70 % hexadecane among the three bacteria. LC-MS/MS analysis tentatively revealed 8-hydroxyhexadecanedioic acid as an extracellular metabolite for *Novosphingobium* sp. and *Gordonia amicalis* while 16-hydroxyhexadecanoic acid was identified for *Gordonia terrae.* These findings suggest that biofilm formation is beneficial for assimilation of non-dissolved organic carbon. Application of biofilms forming bacteria like *Gordonia terrae* is a simple and rational approach for a successful bioremediation technology.

OP – 3

Acute, Oral, and Intravenous Toxicity of Terpene Alcohols and Their GABA Esters

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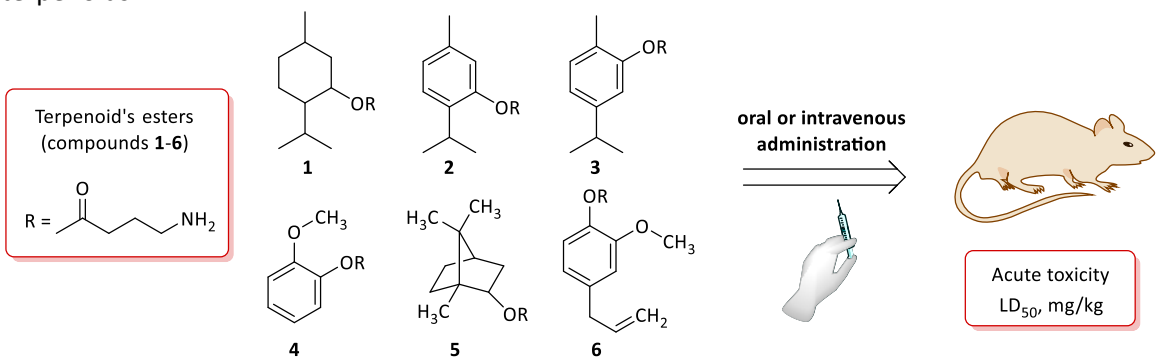
At the present study, acute toxicity (LD_{50} value) of esters based on terpenoids and gamma-aminobutyric acid (GABA) in outbred male white mice was determined for different routes of administration – orally and intravenously. Mice were randomly divided into groups of ten animals in each group and terpenoid esters were administered in doses from 1000-2500 mg/kg for orally and in doses from 20-200 mg/kg for intravenous determination. The animals were observed for toxic symptoms within 24 hours after the compound administration. Acute toxicity of compounds **1**-**6** was compared with the literature values of LD_{50} for the initial terpenoids.



The average lethal dose (LD_{50}, *p.o.*) for all GABA esters exceeds 1000 mg/kg which according to the generally accepted classification allows classifying these compounds to toxicity class III - moderately dangerous.[1] In toxic doses, the main disorders are observed in the respiratory system, namely: accelerated complicated shallow breathing which is accompanied by short-term seizures.

Compound	LD_{50}, mg/kg, *p.o.*	LD_{50}, mg/kg, *i.v.*	Compound	LD_{50}, mg/kg, *p.o.*	LD_{50}, mg/kg, *i.v.*
Menthol	3400	50	**1**	2700	60
Thymol	640	110	**2**	> 2000	120
Carvacrol	471	80	**3**	> 2000	110
Guaiacol	621	170	**4**	1500	90
Borneol	1059	56	**5**	> 2500	96
Eugenol	3000	72	**6**	> 2000	90

p.o. – oral administration; *i.v.* – intravenous injection

The obtained LD_{50} (*i.v.*) values for esters **1**–**6** range from 50–150 mg/kg. Adverse processes with intravenous injection of test esters in toxic doses are similar to those observed with oral administration. Difficulty breathing and seizures in this case occurred immediately after the introduction of toxic doses of esters; death of animals occurred in 30-60 seconds.

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OP – 4

Oxidation of a Basic Textile Dye by Calcium Peroxide

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Calcium peroxide (CaO_2) is an innovative and environment friendly oxidant which can be used as a strong oxidizing agent for the degradation of organic based pollutants such as textile dyes. CaO_2 draws attention among oxidants due to its easy and low-cost production, stable structure, and non-toxic substance.

In the present study, the performance of the calcium peroxide (CaO_2) was investigated for the degradation of Basic Blue 41 textile dye (BB41). For an environmentally friendly process approach, no activator agents that would produce waste were used in the oxidation experiments. The specific morphology, elemental analysis, particle size distribution, specific surface area, identification of crystalline phases and surface functional groups of the synthesized CaO_2 were investigated. The oxidation experiments were performed with distilled water to understand the specific interaction of CaO_2 and BB41. Also, oxidation tests were carried out with simulated textile wastewater, containing production auxiliary chemicals, to investigate the potential use of CaO_2 in textile wastewater. The effects of pH, contact time, BB41 concentration and CaO_2 dosage on dye removal efficiency were investigated.

The results of crystalline phases analysis showed that the synthesized oxidant as CaO_2 with the tetragonal crystalline structure. The signal related to bending vibration of O–Ca–O was determined from the analysis of surface functional groups. The optimum pH value was found 7 for the removal of BB41 by CaO_2.

The experiments showed that the CaO_2 dosage have a significant effect on the removal of BB41. The BB41 removal efficiencies within 45 minutes from distilled water for 0.1 and 0.5 CaO_2 were found to be 73.75 and 96.67%, respectively. 0.1 g CaO_2 was found to be sufficient for the removal of 50 mg/L BB41 from distilled water with 99% removal efficiency. While the removal efficiency of 200 mg/L BB41 within 45 minutes from distilled water by 0.4 g CaO_2 was found 95.1%, it was found 85.5% for the removal of BB41 from simulated textile wastewater. The textile dye production chemicals caused the decrease in dye removal efficiencies due to oxidation of organic based auxiliary chemicals. The results of the present study showed that the CaO_2 can be used as an environmentally friendly and low-cost oxidant for effective removal of BB41.

OP – 5

Olive Mill Wastewater from a Toxic Effluent to an Efficient Carbon-Zinc Composite for the Separation of Industrial Dyes

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The extraction of olive oil generates significant quantities of oil mill wastewater (OMWW). It is a very toxic effluent (BOD_5=14 g(O_2) L^{-1}, COD=116 g(O_2) L^{-1}) and hardly biodegradable (BOD_5/COD=8.2), often discharged without prior treatment. [1] Moreover, this by-product represents a potential source of valuable biomass due to its richness in organic matter (42%), so we thought of transforming and valuing it differently by mixing it with a metal and then carbonizing it to produce an adsorbent composite rich in attractive sites, very porous which will be used in several applications, and in particular the separation of industrial organic molecules.

After having characterized and mixed the OMWW in their liquid state with well-determined zinc contents (0.125, 0.250, 0.500, 1%), these were carbonized by the method of fast pyrolysis at high temperature (800 °C) according to an original process (pyrolysis with thermal shock), fast (2 minutes) and clean (without by-products), until transforming radically the whole into a black solid phase, which is the desired material. Scanning electron microscopy (SEM), energy dispersive spectrometry (EDS), infrared spectroscopy (FTIR), and X-ray diffraction (XRD) were used to determine the composition, morphology, and porosity of the resulting carbon composites.

After optimizing the content of added zinc ions (Zn^{2+}), the obtained material is porous, of high quality (79% carbon), rich in anionic attractive sites, and contains no impurities. Two dyes with opposite charges were chosen to study the adsorption power of the composites, namely methylene violet (cationic) and methyl orange (anionic). From a thorough comparative study (isotherm, kinetics) of the adsorption of these species on the elaborated composite, it was found that methylene violet shows a high affinity towards the elaborated carbon-zinc composite, with a high adsorption capacity up to 780 mg g^{-1}, and start-up kinetics of the order of 85 mg g^{-1} min^{-1}, with a separation coefficient R_L close to 0 indicating that it is very favorable adsorption. In contrast, its anionic counterpart (methyl orange) was weakly adsorbed on the developed composite, with a small amount adsorbed on the surface on the order of 25 mg g^{-1} and negligible start-up kinetics on the order of 2 mg g^{-1} min^{-1}, with a separation coefficient close to 1 indicating unfavorable adsorption. Their simultaneous adsorption gave similar results, where an amount on the order of 530 mg g^{-1} of methylene violet was adsorbed in contrast to its anionic counterpart (methyl orange) which was weakly adsorbed on the surface of 23mg g^{-1}, indicating a separation of these two oppositely charged species where methyl orange remains in its aqueous medium and its counterpart methylene violet on the composite surface. The regeneration is carried out in an acidic environment at low temperatures. After these detailed studies, we can affirm that it is possible to find solutions to the environmental problems caused by the discharges of toxic effluents, according to the principles of green and sustainable chemistry, whatever their origins their compositions and their natures, and the method of elaboration of carbonated composites starting from a liquid discharge constitutes a new way of their valorization.

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OP – 6

Synthesis of Sulfonated PET Flocculants and Investigation of Their Performance in Plastic Washing Wastewater Treatment

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The continuous rising of commodity plastic demand has led to increasing quantity of waste generation. Plastic recycling/recovery methods provide valuable raw materials having economical value and make the plastics remain in the system. Prior to recycling procedure, the shredded waste plastics are usually washed with NaOH. The main characteristic parameters of the waste plastic washing effluent (WPWW) are turbidity, chemical oxygen demand (COD) and high pH, and these indicate that wastewater needs treatment. Coagulation-flocculation is the most commonly applied physicochemical method for turbidity removal. Flocculants are polymers used to create the flocs.

Sulfonation is one of the methods to modify the surface properties of polymers in order to achieve characteristics. Those sulfonated polymers have a broad variety of applications. Polystyrene (PS) sulfonation transforms the aromatic PS into a polymeric flocculant by changing the benzene hydrogen atom by sulfonic acids. Both conventional and modified PS sulfonation has been applied. Although polyethylene terephthalate (PET) is another aromatic polymer, PET sulfonation had not been studied yet. Therefore, the purpose of this study is to apply the conventional and modified PS sulfonation to PET, to reveal the possibility of obtaining new flocculant material; to investigate the effectiveness of the synthesized flocculants on treatment of different WPWW, which were the effluent of washing process of HDPE, LDPE, PET, PP, PS, and mixed waste plastics samples. Three different modified sulfonated PET samples (FSPET1,2,3) were synthesized. The effectiveness of synthesized materials in coagulation/flocculation treatment of WPWW in terms of turbidity and COD removals were investigated. For comparison, conventional sulfonated PS (FSPS) was synthesized and conventional flocculant, polyelectrolyte (PEL) was used. The best operating conditions were selected, and sludge properties were presented in the optimized condition.

The turbidity removal performances of the synthesized FSPET samples varied between 71 and 86%, whereas COD removal performances varied 20 to 62%. Lower COD removal was due to high pH as the first trials were performed at the original pH of the wastewater (avg.13). Under the same conditions, the achieved turbidity removal efficiencies by FSPS and PEL were almost the same, while their COD removal efficiencies were slightly lower. The flocculant dosage and pH optimization has increased these performances and the optimum dosage and pH were identified for each synthesized FSPET and for each studied WPWW. As a result of the optimized treatment, the sludges with low volume (avg.180 ml/L), high solids content (avg.8756 mg/L), high density (avg.1.02 g/cm^3) high solids content (avg.87%), and low specific cake resistance (avg.2E+13 m/kg) were obtained. FSPET3 whose final precipitation phase is carried out with NaOH in the synthesis process, was the least successful one while FSPET1 and FSPET2 were more successful in treatment. This indicated that, in flocculant synthesis Na_2CO_3 and $CaCO_3$ can be used to precipitate the product. The study provided both an effective industrial wastewater physicochemical pretreatment and effective plastic recovery.

OP – 7

Green Synthesis and Characterization of Iron Nanoparticles Using Black Tea Waste Pulp

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Iron nanoparticles are preferred due to their unique physical and chemical properties in recent years.[1-2] Nanoparticles can be synthesized with physical, chemical and green methods.[3-4] Nanoparticles that is synthesized by physical and chemical methods; are so expensive, have high toxicity and cause negative and deadly effects on the environment and microorganisms. Therefore, the interest in green synthesis is increased.[5-6] Nanoparticles produced by green synthesis, on the other hand, are a cheap, fast, and easy method with low toxicity, completely natural, ecosystem friendly and easily produced without the need for various operating parameters such as temperature, high pressure, energy.[5-6-7] In green synthesis, nanoparticles are produced by using various reductants such as bacteria, plants, algae, yeast, fungi, microalgae and diatoms.[2] Photochemicals play an active role through plant in the green synthesis method. The reducing or antioxidant compounds in the root, fruit, leaf, seed of the plant are responsible for the reduction of metal compounds.[4-5] Chemicals found in the plant are reducing agents such as amino acids[8], sugar[7], citric acids, phenols, flavonoids, vitamins, heterocyclic compounds.[9]

The aim of this study is to produce and characterize nanoparticles that is green, easy, cheap, sustainable, environment- friendly, waste-preventing, and less harmful that minimizes harmful by-products using black tea waste pulp. The synthesized nanoparticles will then be used in environmental engineering approaches. In green synthesis, black tea pulp waste was preferred with the aim of recycling waste that is frequently used in Turkey as a drink. Black tea is a good antioxidant and a reducer such as phenols, amino acid, flavonoids, proteins.[10]

This study consists of two stages. In first stage of study, waste tea pulp was brew under circumstance 1h and 80°C. Secondly, 1:1 complex solution (Fe-extract) was created and mixed for 2 hours. At this stage, the extract pH was reduced to 3,88 from 5,33 right away and the color changed from golden to black immediately, after nanoparticles production. This is a condition that indicates a reduction in iron ions.[4] The green synthesized iron nanoparticles were characterized using SEM, Fe-SEM, FTIR, DLS, BET, UV-VIS spectrophotometer, EDX, XRD, Zero Point Charge, Zeta Potential. In SEM images, the size average value was found as <100 nm. In Fe-SEM images, it was observed that the iron particles are in the form of cubes. Absorption peaks at wavelength of 200 nm and 270 nm. Colloid stability was determined as relatively stable at -11.7.

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OP – 8

Determination of Serum Levels of Zinc and Boron by ICP-MS method in Experimental Diabetic Rats

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Diabetes Mellitus is the commonest major metabolic disease with high mortality and morbidity risk in the world which is characterized by hyperglycemia induces. Although the mechanism of trace elements on diabetic patients has been explained as providing the activation of insulin receptor sites, being a cofactor or component for enzymes in glucose metabolism, and acting as an antioxidant that increases insulin sensitivity, the effect of each trace element has not yet been fully elucidated.[1] Zinc and boron, which have important roles in glucose and lipid metabolism, respectively, have important roles in the secretion, synthesis, and storage of insulin. In addition, with the antioxidant properties of both trace elements, it can play an important role in diabetes caused by oxidative stress.[2, 3]

The aim of this study was to determine and compare the serum zinc and boron levels in normal and diabetic rats in order to understand the roles of both zinc and boron in diabetes. Type 1 diabetes was induced in rats by administration intraperitoneally in a single dose of high dose streptozotocin (STZ) to the overnight fasted rats. After three days of STZ administration, rats were considered as diabetic rats, if the fasting blood glucose levels measured by Accu-Chek glucometer >300 mg/dL. Six rats, each with STZ-induced diabetic and control, were included in the study. Rats were sacrificed under deep anesthesia, and later blood samples were taken from the heart of rats. Inductively Coupled Plasma-Mass Spectrometry ICP-MS method, which is very elegant procedure for evaluation the analysis of multiple elements at the same time, was used in this study to determine the zinc and boron in serum. For serum sample preparation, nitric acid and hydrogen peroxide were added to the serum samples and obtained solution were burned by using blood method in Milestone ETHOS UP High-Performance Microwave Digestion System. After degradation, samples were diluted with Milli-Q deionized water and analyzed by ICP-MS. The proposed ICP-MS method was validated. With this purpose, calibration curve obtained by plotting calibration curves between peak areas and added concentrations to be determine the method linearity. The equations for calibration curves were obtained in 10-500 ng/mL concentration range for both Zinc and Boron.

The method was found as precise with ≤3.25 RSD%, and accurate with ≤ ± 2.58 RE % for both elements. The mean recovery % was determined as 101.4±5.46% for boron and 98.2±4.53 % for zinc. The limit of detection (LOD) and limit of quantification (LOQ) values found as 2.14 ng/mL and 7.06 ng/mL for boron and 1.55 ng/mL and 5.11 ng/mL for zinc, respectively. The both serum zinc and boron levels in the STZ-induced diabetic rats were significantly lower than control rats ($P < 0.01$).

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OP – 9

Green Adsorbent Based on Alkali-Activated Aluminosilicate for Heavy Metal Removal

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The goal of this study is to determine how efficient alkali activated aluminosilicate materials (AASM) made from waste fly ash are as a sorbent material for heavy metals in aqueous solutions. Batch experiments were carried out to assess the effects of various experimental factors on the removal of Cu, such as initial pH, contact time, adsorbent dosage, and initial concentration. pH 5.0, 1 g/L of solution adsorbent dosage, and 1 h of equilibrium duration were shown to be the best conditions for Cu removal from aqueous solution. Cu adsorption kinetics were pseudo-second order. The heavy metal removal mechanism does not appear to be controlled by intra-particle diffusion. Freundlich, Langmuir and Temkin isotherm models were used to assess equilibrium isotherms for Cu adsorption on AASM using a non-linear regression technique. The data for Cu adsorption onto AASM was found to be best represented by Langmuir isotherms. An increase in the temperature of the aqueous solution has a positive effect on Cu adsorption on AASM. The Gibbs free energy is negative, indicating spontaneous Cu adsorption on AASM. Overall, the adsorptive properties of AASM for the removal of Cu from aqueous solution were outstanding.

OP – 10

Potential of Water Resources of the Republic of Kosovo and the Concept Water Management

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The Republic of Kosova declared its independence on 17 February 2008, with a total area of 10,877 km^2 and a population of approximately 2 million. Management plans for many of the country's natural resources are preparation phase. So, sustainable, balanced, and rational use of existing water resources is very important.[1,2] All fresh waters in the Republic of Kosova contain good quality water in its source. In particular, because of the suitable slope conditions, the areas where high quality water is available in the source parts of the fresh waters in the country provide a suitable topography for the purpose of storing clean water in periods when new reservoirs are made and there is a surplus.[3–5]

As a conclusion the problems of irrigation of agricultural areas with traditional methods, in many settlements of the Republic of Kosovo and the inability to use water efficiently due to water shortage in the dry summer months, have been revealed. Also, this study the pollution in these fresh waters were seen to be mostly influenced by a combination of anthropogenic factors, agricultural pollutants, tourism activities, domestic waste, and sewage water. Water management based on fresh waters should be developed and monitoring programs for surface and ground waters must be achieved.

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OP – 11

Synthesis of Quantum Dot–Polymer Composites for Environmental Applications

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In this study, new PBAT/QDs nanocomposite films were prepared for the removal of methylene blue from wastewater by solution casting. The PBAT/QDs nanocomposite films were prepared by combining PBAT and CdSe QDs nanoparticles after preparing the water-soluble CdSe QDs nanoparticles by Hydro (solvo)thermal synthesis method. The characterization of the PBAT/ CdSe QDs nanocomposites were investigated by UV-vis spectrophotometer, X-ray diffraction (XRD) and the Fourier Transformation Infrared Spectroscopy (FTIR). PBAT/ CdSe QDs nanocomposites were used for the removal of dyes from wastewater was carried out. The strong hydrogen bonding connection between PBAT polymer and QDs nanoparticles was confirmed by XRD patterns and FTIR spectra. The concentrations of CdSe QDs nanoparticles implanted in the PBAT matrix are responsible for the tunable structure and optical properties of the PBAT/ CdSe QDs nanocomposite. Adsorption process experiments showed that the (PBAT/ CdSe QDs 2 wt%) nanocomposites are able to remove a high amount of the methylene blue (10 mg/L) from an aqueous solution at room temperature, and the removal efficiency was 99% in 3 hours. Moreover, the adsorbent removal efficiency was 92% after five times regeneration with ethanol.

OP – 12

Variability of Antibiotic Resistant Bacteria Removal Through Wastewater Treatment Processes and Their Occurrence in Receiving Surface Waters

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Tetracycline is a commonly used antibiotic in human and veterinary medicine. It is frequently detected in the environment due to overuse. When these antibiotics enter the wastewater treatment plants, their removal would depend on the treatment efficacy. Similarly, antibiotic-resistant bacteria are on the rise globally due to antibiotic overuse. WWTPs may not be removing these bacteria through their conventional treatment procedures. This study compared the removal of tetracycline-resistant *Escherichia coli* in wastewater treatment plants (WWTP) with chlorine or UV methods as disinfection and the levels of bacteria entering surface waters through these plants.

Samples were collected from four WWTP (two with UV and two with chlorine disinfection) from influent, secondary treated, and disinfected effluents and upstream and downstream rivers and beaches. Serial dilutions with sterile phosphate saline water with 10^1 to 10^6 were used for detecting bacteria concentrations from influents and secondary effluents. Triplicates of diluted influents, secondary and undiluted disinfected effluents, and surface waters were filtered (100 ml each) through a sterile membrane filtration system using 0.45 µm sterile filters. Tetracycline resistance bacteria (TRB) were enumerated by culturing these filters on mL Agar plates with tetracycline (final concentration 16µg/L) at 37∓ 0.5 ℃ for 24 hrs. A control set of filters were also incubated on media without tetracycline at the same conditions, and TRB resistance was calculated as percentages.

At the WWTP with chlorine disinfection, TRB were present in the influent with an average of 5% of the total *E. coli* population. The presence of TRB significantly increased during secondary treatment (20%), and disinfection decreased TRB presence to 15% in the effluent. TRB resistance also increased significantly ($p<0.001$) during secondary treatment in WWTP with UV disinfection. The percentage of TRB of the total E. coli at this type of plant at the influent (13%) was very similar after UV disinfection (12%), indicating that TRB leaving the plant was a significant portion of the E. coli. At the receiving river, 20% of the samples exceeded safe recreational water guidelines for recreational activities.

This study showed that TRB may be removed at varying rates depending on the disinfection method and even gain resistance during treatment processes. Effluents from wastewater treatment plants contribute to antibiotic resistance in surface waters in varying concentrations, ultimately affecting environmental health.

OP – 13

Full Paper

ZnCr Layered Double Hydroxide@Biochar as Novel Sonophotocatalyst for Antibiotic Decontamination

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Abstract
In the present study, ZnCr LDH@biochar (ZnCr LDH@BC) was synthesized and characterized using various analyses. The successful synthesis of the sample was confirmed well by the XRD analysis. SEM was used to evaluate the morphology of the synthesized ZnCr LDH@BC. The simultaneous presence of C, Zn, and Cr elements was well confirmed by EDX analysis illustrating the successful synthesis of ZnCr LDH@BC nanocomposite. The catalytic performances (sonocatalysis, photocatalysis, and sonophotocatalysis) of the so-synthesized sample were studied for the degradation of Rifampicin (RF) as a kind of antibiotic. The sonophotocatalytic activity of the specific amount of ZnCr LDH@BC toward 15 mg L^{-1} of RF under 150 W ultrasound and visible light irradiation was found to be 98%. More attempts were made to delineate the role of the ROSs and a probable mechanism for the degradation of RF in the presence of different scavengers, photoluminescence (PL), and GC–MS analyses, respectively. Furthermore, the stability of the catalyst is noted as the most influential parameter for long-term application. The degradation efficiency decrement was not significant after four consecutive cycles, which consented to the robustness of ZnCr LDH@BC.

1. Introduction

Organic contaminants, including pharmaceuticals, are commonly used and discharged into water, posing a global challenge.[1] With the expansion of industrialization and urbanization, refractory organic compounds-containing wastewaters have become a main challenge in recent decades.

Advanced oxidation processes (AOPs) are highly desired based on the production of reactive oxygen species (ROSs), which can turn hazardous pollutants into none/low toxic small structures.[2] Recently, combinations of various AOPs have been used, primarily to treat harmful compounds in wastewater.

It is worth noting that the combination of ultrasonic (US) and light irradiation promotes the degradation efficiency of organic compounds. So, ultrasound-assisted photocatalytic process specifically manifests the high degradation of a broad domain of contaminants.[3,4]

Layered double hydroxides (LDHs), as well as anionic clays, appear to be more promising environmental remediation alternatives. Under light irradiation, bare LDHs typically have low charge carrier mobility, resulting in rapid electron-hole recombination and low quantum yield.[5]

Modified layered double hydroxide nanocomposites are more promising alternatives for environmental remediation.[2] Due to high stability, conductibility, and catalytic performances, LDH-based nanocomposites can play a critical role in treatment processes as an eminent catalyst. Currently, studies have been published in the literature describing the widespread use of carbon-enriched materials in the structure of different nanocomposites. Biochar (BC) can be obtained from a variety of natural or waste sources under oxygen-

restricted conditions and has enormous potential for nanocomposite synthesis due to the significant characteristics such as enriched surface functional groups, high porosity, and high surface area.[6]

In the present study, ZnCr LDH@BC was prepared and characterized by different analyses. The influencing factors on the sonophotocatalytic process for the decomposition of RF molecules in the presence ZnCr LDH@BC nanocomposite were then thoroughly investigated. Ultimately, this work can provide a new viewpoint and theoretical support for applying ZnCr LDH@BC as an effective sonophotocatalyst for the degradation of refractory contaminants.

2. Materials and Methods

All the chemicals were procured from Merck, Germany. Besides, BC was synthesized by flame curtain pyrolysis of Pine-tree (*Pinus halepensis*). For the synthesis of ZnCr LDH@BC, the ultrasonically dispersed BC solution was made by diluting 0.08 g BC in distilled water. By adding NaOH solution (2 mol L^{-1}), the pH of the solution containing $Zn(NO_3)_2.6H_2O$ and $Cr(NO_3)_3.9H_2O$ was raised to 9. The BC solution was added and agitated for another 30 minutes before being transferred to a stainless-steel autoclave lined with Teflon. The autoclave was placed in a preheated oven set to 90 °C. The sediment was rinsed with deionized water and dried.

3. Results and discussion

SEM analysis was used to evaluate the morphology of the prepared ZnCr LDH@BC. The formation of ZnCr LDH layers on the surface and inside the pores of the BC can be observed in the SEM images shown in **Fig. 1a**. The simultaneous presence of C, Zn, O, N and Cr elements in the EDX analysis (**Fig. 1b**) of ZnCr LDH@BC shows that this nanocomposite was successfully prepared.

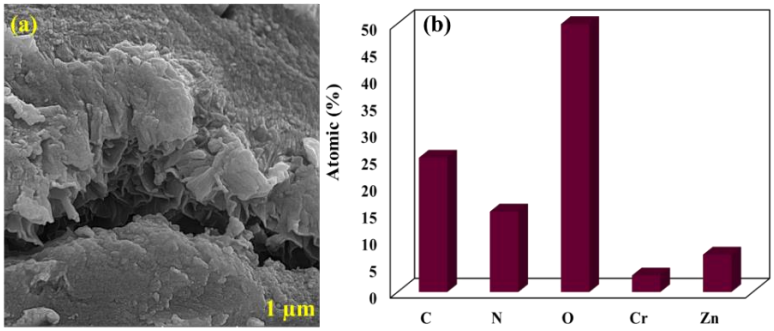

Fig. 1. (a) The SEM image and (b) The EDX analysis of ZnCr LDH@BC.

XRD analysis was used to determine the crystalline structure of ZnCr LDH@BC, and the results are shown in **Fig. 2**. The 003, 006, 101, 012, 015, 018, and 110 reflection planes of ZnCr LDH are represented by the characteristic bands at 2θ of 10.1°, 20.0°, 32.5°, 34°, 39.5°, 48.5°, and 60.6°, respectively (JCPDS standard card 51-1525). Because the amount of BC in the nanocomposite is much lower than the amount of ZnCr LDH, the characteristic bands of BC did not appear well in the XRD pattern.

The efficiency of the diverse processes is shown in **Fig. 3a**. The enhancement in sonophotocatalysis can be related to the light radiation in the presence of ultrasonic waves which can provide a synergistic effect (Synergy factor = 2.08) by the generation of highly reactive free radicals such as hydroxyl radicals (•OH). ROSs are primarily thought to be important contributors to the degradation of refractory pollutants via AOPs. Thus, p-BQ, FA, and IPA were added in that order to test for the presence of superoxide anion radicals, holes, and hydroxyl radicals, respectively (**Fig. 3b**). According to the degradation efficiency decrement in the presence of IPA, it is clear that hydroxyl radicals play an important role in RF disintegration during sonophotocatalysis.

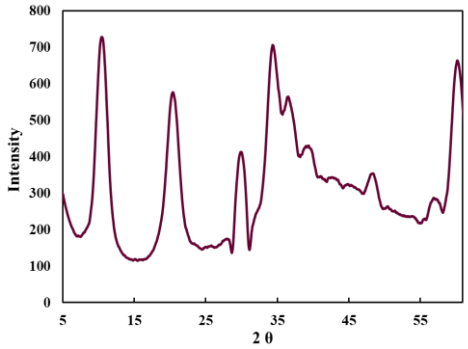

Fig. 2. The XRD pattern of ZnCr LDH@BC.

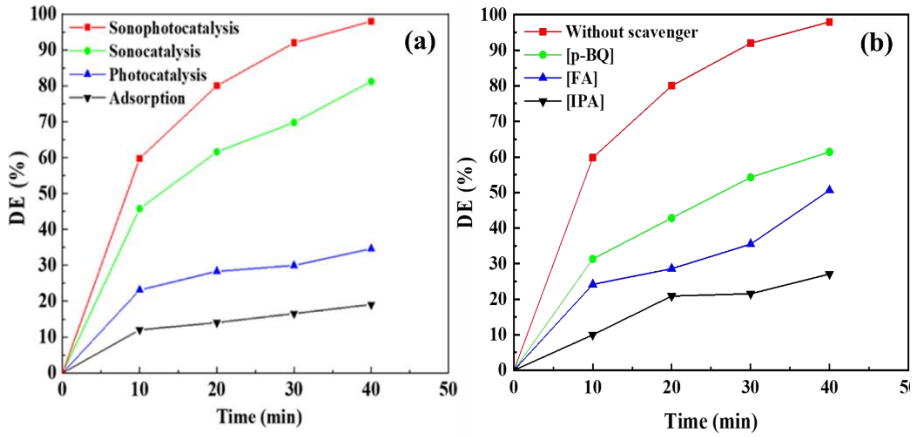

Fig. 3. (a) Comparison of the degradation efficiency of RF in the different processes and (b) the impact of diverse scavengers. (pH =8, [RF] = 15 mg/L, catalyst = 0.6 g/L, ultrasonic power = 150 W, and under visible light).

The PL analysis was used to assess the production of hydroxyl radicals during the sonophotocatalytic process (**Fig. 4a**). The PL spectrum was more intense for 40 minutes compared to 20 minutes of reaction time, indicating that the hydroxyl radicals increased as time passed during the sonophotocatalytic process. GC-MS analysis was utilized to explore a possible mechanism of RF degradation through sonophotocatalysis. In the present study, eleven main molecules were detected, and the degradation mechanism was proposed.

In this study, ZnCr LDH@BC was reused during four successive tests, and the degradation efficiency during sonophotocatalysis was calculated. Following four cycles, the degradation efficiency decrement was not significant (around 19%), as shown in **Fig. 5**.

4. Conclusion

Successful preparation of the ZnCr LDH@BC was developed, and various analyses were performed to characterize the resulting sample. The sonophotocatalytic property of the ZnCr LDH@BC was then evaluated for RF disintegration. ZnCr LDH@BC with the dosage of 0.6 g L^{-1} illustrated the exceptional activity (DE% = 98%) toward 15 mg L^{-1} of RF, ultrasonic power of 150 W, and under visible light. Furthermore, GC-MS analysis revealed eleven generated by-products as well as the potential mechanism.

Acknowledgment

We would like to thank the Scientific and Technical Research Council of Turkey for funding the research project (TUBITAK, Project Number: 120Y350).

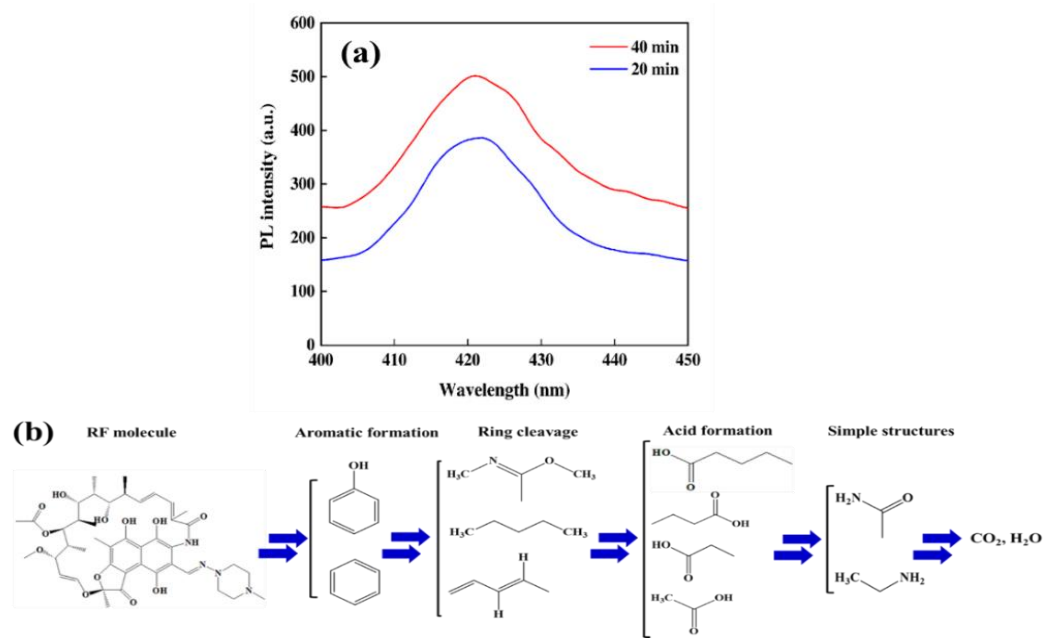

Fig. 4. (a) PL spectra at diverse reaction times for sonophotocatalytic degradation of RF in the presence of ZnCr LDH@BC nanocomposite and (b) the plausible mechanism of the sonophotocatalytic decomposition of RF.

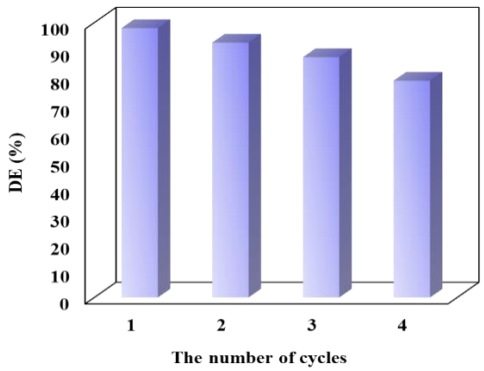

Fig. 5. The reusability behavior of ZnCr LDH@BC after four consecutive experiments. (pH =8, [RF] = 15 mg/L, catalyst = 0.6 g/L, ultrasonic power = 150 W, and under visible light).

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OP – 14

Determination of Essential Oils in Commercial Lavender Oil

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Essential oils are largely employed for their therapeutic properties, being marketed extensively in pharmaceutical and cosmetic industry. Lavender oil is known for its excellent aroma and is extensively used in the perfumery, flavour and cosmetic industries. The oil is known to possess sedative, carminative, antidepressive and antiinflammatory properties.[1]

The aim of our study was to assess the purity and quality of lavender oils, available on the market from various commercial producers. Therefore, essential oil compositions of lavender oil were analyzed using gas chromatography-mass spectrometry (GC-MS). Chromatographic analyses were carried out on an Agilent 7820A gas chromatography system equipped with 5977 series mass selective detector, 7673 series autosampler and ChemStation. HP-5 MS column with 0.25 µm film thickness (30 m × 0.25 mm I.D.) was used for separation. The temperatures of the inlet, transfer line and detector were 250, 250 and 300 °C, respectively. Different temperature programs were investigated for GC-MS method.

The end of this investigation, the temperature program of the GC-MS was as follows: initial temperature was 60 °C, held for 10 min, increased to 220 °C at a rate of 4 °C/min held for 10 min, increased to 240 °C at a rate of 1.0 °C/min held for 0 min. The injector volume was 1 µL in split mode (40:1) and the carrier gas was helium at a flow rate of 0.8 mL/min.

Thirty-three chemical essential constituents were identified based on GC-MS in lavender oil supplied from herbalist. The components were identified by comparing linear Kovats retention index, their retention times and mass spectra with those obtained from the MS library. The major components of the lavender oil were linalyl acetate (37.82 %), linalool (33.07 %), eucalyptol (4.88 %), camphor (4.07 %), lavandulol acetate (1.53 %) and caryophyllene (1.43 %).

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OP – 15

Effect of Covid-19 on Air Quality in Kayseri Province

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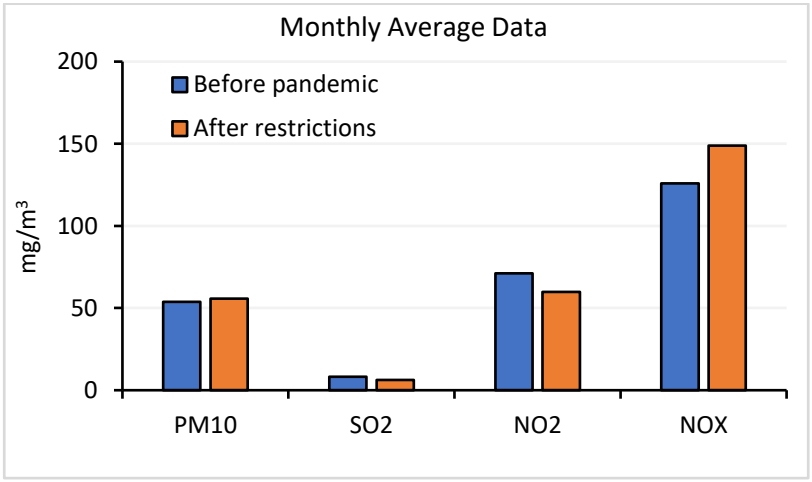
There are many consequences that is originated from Covid-19 pandemic. One of the environmental consequences of Covid-19 is air pollution levels since many countries declared lockdowns. Air pollution is one of the most important problems in Kayseri Province, especially in winter, due to industrialized, highly populated city in a hollow topography. In this study, two years (one year before the pandemic began and one year after the restrictions starts) data of air quality parameters in Hürriyet Station of Kayseri (very close to city center) are monitored from online website for particulate matter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), and nitrous oxides (NO_x). Monthly average data is compared before and after Covid-19 outbreaks (after April 2020). Pollution data is driven as monthly as average, minimum, and maximum. Results showed that, for the monthly average data, only SO_2, CO and NO_2 pollution rates are decreased after restrictions. Maximum values are only seen before the pandemic. Pollution decrease rates are highest to lowest for SO_2, CO, and NO_2 as 32,6%, 19,8%, and 18,7% respectively.



OP – 16

Impacts of Droughts on Air Pollution over Turkey

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As a natural disaster, drought affects many sectors such as agriculture and hydrology, as well as having an effect on air quality. In terms of air pollution, drought can reduce wet scavenging of pollutants and change their chemical production/loss and lifetime. This study investigates the relationship between drought events and air pollutants for Turkey. For drought events, The Standardized Precipitation-Evapotranspiration Index (SPEI)-1 month values were used to investigate the changes in PM_{10}, $PM_{2.5}$, O_3 concentration levels in air quality stations during dry (SPEI<-0.99), normal (-0.99<SPEI<0.99), and wet (SPEI>0.99) conditions. Monthly PM_{10} values from 80 stations for the 2010-2018 period, $PM_{2.5}$ and O_3 values from 10 and 15 stations, respectively, were used for the analysis throughout the 2014-2018 period. According to the main results, it was found that while the frequency occurrence of normal conditions decreased in the last period (2010-2018), when compared to the first period (1901-2009), drought conditions have significantly increased in each region of Turkey in the last period. Highest increase in drought events occurred in the inner and southern parts of Turkey. The stations located in the inner and southern parts of Turkey show obvious statistically significant negative relationship (-0.38<r<-0.70) between SPEI and PM_{10} values during summer and fall seasons. In dry events, while PM_{10} concentration levels of the stations show above-normal values, highest regional increase in PM_{10} was found in the Central Anatolia (CAR), Mediterranean (MeR), Aegean (AR), and Marmara (MR) regions of the country. Similar to the PM_{10}, above-normal $PM_{2.5}$ concentrations were found during dry SPEI values at stations located in the MR. On the other side, there was no significant increase between dry events and O_3 levels in MR.

OP – 17

Investigation of the Change of Particulate Matter (pm_{10}–$pm_{2.5}$) Concentrations in Erzurum City Center Atmosphere in the Pre- and Post-COVID-19 Pandemic Period, Drawing and Comparison of Areal Air Quality Pollution Maps

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The problem of air pollution which emerged more prominently after the industrialization revolution is among the main sources of both direct and indirect local and global environmental problems. Particulate matter (pm) is among the most important air pollutants in the urban atmosphere. Pms' are classified as $pm_{0.1\text{-}1}$-$pm_{2.5}$-pm_{10} (ultra-fine, fine and coarse particles) according to their particle sizes. If we compare pms' in terms of their mobility and lifetime in vertical or horizontal position; ultrafine particles can be transported **meters** away from their source and their lifetime is from **minutes to hours**. Coarse particles can be transported up to a distance of **10–100 km** and their lifetime is from **hours to days**. Fine particles can be transported thousands of **kilometers** long and have a lifetime of **days to weeks**.

The COVID-19 virus, which originated in China and became a global epidemic in 2020, fatally affects human health. Many precautions and measures have been taken throughout the world during the outbreak of the virus and the pandemic period. Among these measures, similar restrictions such as stopping industrial production processes, closing logistics and human mobility to crossings between countries, reducing all humanitarian activities as much as possible, and even imposing lockdowns by country administrations from time to time had a positive effect on air quality in some cities.[1–3] Due to the changing human needs and activities during the pandemic period, there have been some important changes and developments in air pollution, energy use, global warming and climate change.[3–5] For all these reasons, it has been inevitable that there will be significant changes in the concentrations of air pollutants in urban atmospheres.[5–7]

In this study; starting from March 2019, the change in $pm_{2.5}$ and pm_{10} concentrations in Erzurum city center between March 2020 and June 2021, covering summer and winter periods, has examined in detail. Based on the daily average $pm_{2.5}$ and pm_{10} data obtained from five air quality monitoring stations affiliated to the Air Quality Monitoring Network (UHKIA) of the Ministry of Environment and Urbanization of the Republic of Turkey, the areal air quality pollution maps created using the **ArcGIS (GIS)** program have compared.
Keywords: Air Quality, Covid-19, $pm_{2.5}$, pm_{10}, GIS

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OP – 18

Metal Distribution in Plants Around the Cement Factory in Erzurum

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Cement is the basic component of concrete used for building construction and civil engineering. On average, approximately one ton of concrete is produced annually for each person in the World. Companies producing cement with the developing technology are still producing in higher volumes compared to the past. Increasing cement production levels has become one of the leading causes of environmental pollution[1].

The atmosphere polluted by cement plants is known to contain high levels of heavy metals such as aluminum, manganese, lead, cadmium, nickel, zinc, copper, and beryllium. Heavy metals in cement dust play an important role in disrupting various metabolic processes in plants and therefore, cause detrimental effects on the growth and development of plants[2]. It has been clearly demonstrated by various studies that direct uptake by air and indirect uptake from the soil through roots cause heavy-metal accumulation in plants; pollution originating from the cement industry disrupts the balance between macro and micro elements in plants and causes significant changes in the amount of inorganic elements[3,4].

In this study, it was made with plant samples collected from three regions at different distances (near, middle, far) to the cement factory. As the distance to the cement factory decreased, the heavy-metal concentration increased. These values do not create a serious toxic effect in acute use of the plant; however, they can accumulate in the body with regular consumption of the plant, which can lead to chronic toxicity. Cement factories: pollute nature directly and indirectly through dust particles scattered around during production, packaging, and loading. These dust particles are carried by the wind and accumulate in area close to and far from the factory and affect human beings both through the air and the foods we consume[5]. For this reason, our first goal should be to prevent the spread of dust and other missions in order to protect the soil, air, water, plant around the factory and people[6].

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OP – 19

Evaluation of Heavy Metal and Microbial Contamination of Green Tea and Herbal Tea Used for Weight Loss in the Palestinian Market

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The use of green tea and herbal tea for weight loss is increasing worldwide owing to the rising rates of obesity. There are concerns about the safety and quality of these herbal products owing to their increased consumption worldwide. In this study, we evaluated randomly collected samples of green tea and herbal tea and tested them for heavy metal and microbial contamination. Eighteen samples of green tea or herbal tea of widely used brands in Palestine were tested for heavy metal and microbial contamination. The results showed that 7 of the samples had toxic heavy metals such as chromium (Cr) and lead (Pb), and their concentrations were above the allowable limits set by the World Health Organization (WHO). Moreover, 6 of the samples that were tested had microbial contamination with high total aerobic microbial count (TAMC) and total yeast and mold count (TYMC). This could be due to improper handling and storage conditions of these herbal products. This study is the first of its kind in Palestine and its results are forewarning to all the responsible authorities, including the Ministry of Health (MoH), to take immediate corrective actions such as quality control testing, auditing, and registration of marketed tea products.

OP – 20

Elemental Compositions in Different Organs of *Rapana venosa* (*Mollusca: Muricidae*) from the Eastern Black Sea Region of Turkey: Health Risk Assessment

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This study examined the level of metals (Al, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sr, V, and Zn), metalloids (As and Sb), a non–metal compound (Se, P), and mineral elements (Na, K, Mg, Ca, Ba) in the edible parts (muscular leg and soft tissue) as well as other organs (hepatopancreas, gonad, and operculum), of *Rapana venosa* (veined rapa whelks). Samples were obtained from the Eastern Black Sea. Within the organs of *R. venosa*, the concentrations of Ba, Ca, Cr, Co, Cu, Fe, Ni, P, Mo, Se, Pb, Sr, and Zn showed significant variations ($p < 0.05$). The operculum possessed significantly higher levels of Ba, Co, Cr, Fe, Mo, Pb, Se, while hepatopancreas had substantially higher levels of Ca, Cu, Ni, P, Sr, Zn. Risk to human health posed by the exposure of the study elements via the consumption of the edible parts of *R. venosa* was assessed by the target hazard quotient (THQ) and total THQ (TTHQ). THQ and TTHQ values were less than 1, indicating no significant potential health risk to human through the consumption of *R. venosa*.

OP – 21

Electrosorption of Cadmium ions using a Soft, Stable and Efficient Electrodeposited Nanostructured Manganese Oxide

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In recent years, water contamination by cadmium has become a global problem caused mainly by intensive human activities. Exposure to cadmium causes major risks to human health and the environment.[1] This metal is released mainly during industrial processes such as dyeing, battery production, and metallurgy. Therefore, it requires strict control of cadmium concentration in wastewater and industrial discharges.

Among the techniques frequently used for the removal of cadmium ions are chemical precipitation, membranes, ion exchange, etc. However, the application of the majority of these processes is limited due to their high implementation cost, complex operation. As a metal ion removal technology, it is very interesting to use nanomaterials such as manganese oxides with a large adsorption surface, a mesoporous structure,[2] and a high adsorption capacity.[3] The present work focuses on the electrodeposition of manganese oxide nanomaterials using electrochemical methods based on a simple and inexpensive protocol. The structures and morphologies of the formed thin films have been characterized by different spectroscopic techniques. Electrosorption is used as a technique to remove cadmium ions from aqueous solution by studying several parameters such as (applied potential, contact time, quantity of electrodeposited nanomaterial, concentration of metal ions and temperature... etc). The results show a high reactivity and stability of the thin films during the interaction process. A comparative study of the removal efficiency of cadmium was carried out using adsorption and electrosorption techniques.

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OP – 22

Separation-Preconcentration of Parabens with Metal Organic Frameworks Prior to HPLC Analysis

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Parabens with antibacterial and antifungal activity, which are used as preservatives in food, cosmetics, and pharmaceuticals, are defined as biocides. Today, our most natural resource, water, has become an important resource for the storage and collection of parabens.[1] Exposure to parabens can cause disruption of the human endocrine system and skin allergies and increase the risk of breast cancer[2]. Therefore, the determination of parabens by accurate, sensitive, and selective methods is important for water and aquatic life. Different adsorbents and methods are used for the detection of parabens such as methylparaben, ethylparaben, propylparaben, and butylparaben. In this study, metal organic frameworks (MOFs), one of the new generation adsorbents, were used for the pre-chromatographic analysis of parabens. MOFs, which have highly ordered crystal structures, high specific surface areas, good adsorption performance, easy to chemically change exchangeable structures and adaptive pore sizes, are used as new functional porous materials in the environmental field.[3] In this study, MIL-101 (Cr), synthesized as an adsorbent in the analysis of parabens, was characterized by XPS, SEM-EDX, TGA, and FTIR analysis, followed by pH, amount of adsorbent, adsorption time, desorption solvents, desorption time, pre-concentration factor parameters are optimized. The separation-preconcentration of the simultaneous adsorption of methylparaben, ethylparaben, propylparaben, and butylparaben to MIL-101 (Cr) was performed using the HPLC-DAD system in the water samples.

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OP – 23

Bioremoval of Methylene Blue Dye from Aqueous Solutions Using *Fraxinus excelsior* L. (Oleaceae) Biosorbent; Isotherm, Kinetic and Thermodynamic Studies

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With the development of industries, wastewater from industrial factories causes serious damage to the environment. Since synthetic dyes used in dye industries have dangerous properties such as mutagenic, toxic, and teratogenic, wastewater from these factories should not be discharged without treatment.[1] There are many treatment processes for the removal of synthetic dyes from aqueous solutions. Among these processes, the biosorption process, which is a new biotechnology application, has taken its place in the literature due to its low cost, effective treatment, and sustainability.[2]

In this study, a biosorption study was carried out by using *Fraxinus excelsior* L. (Oleaceae) biosorbent (FEO) as natural waste to remove methylene blue dye from aqueous solutions. According to the results of studies carried out under optimum conditions (pH: 6, initial dye concentration: 5 mg/L, biosorbent dose: 1 g, contact time: 30 min., stirring speed: 150 rpm and temperature: 298 K), it was determined that using FEO biosorbent removed 89% of methylene blue dye from aqueous solutions. In this study, parameters affecting biosorption (pH, initial dye concentration, biosorbent dose, temperature and stirring speed) were examined, and isotherm, kinetic and thermodynamic studies were also performed. Freundlich, Langmuir, Elovich, Temkin and Dubinin–Radushkevich isotherms were calculated in the isotherm studies and Freundlich isotherm (R^2=0,966) was found to be higher than other isotherms.

According to the results calculated in the kinetic studies, it was found that the pseudo-second order kinetic model (R^2=0,997) was higher than the pseudo-first order kinetic model (R^2=0.618). It has been obtained according to the ΔG values calculated in the thermodynamic studies that the process takes place naturally and spontaneously.

As a result, it has been concluded that the use of FEO biosorbent can be preferred because it is effective treatment, low cost and ecofriendly in removing synthetic dyes from aqueous solutions.

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OP – 24

Solid Phase Extraction of Thiram on NH_2-MIL-53 (Al)

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Thiram is a non-systemic fungicide used to prevent crop damage in the field and to protect harvested crops from spoilage during storage or transport. Thiram, one of the dithiocarbamates of the carbamic acid class of fungi, changes thyroid hormone levels and/or weights.[1] For this reason, reliable, accurate and sensitive analysis of thiram is important for human health, aquatic life, and the environment. Metal-organic frameworks (MOFs) are a class of advanced hybrid crystal materials containing metal ions and organic ligands.[2]

In this study, NH_2-MIL-53 (Al) was used as an adsorbent for solid-phase extraction of thiram prior to HPLC analysis. X-ray Photoelectron Spectroscopy (XPS), Fourier Transform Infrared (FT-IR) spectra, X-ray Diffraction (XRD) spectrometry, Thermogravimetric Analysis (TGA), and Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray Analysis (EDX) analyses were used for the characterization of NH_2-MIL-53 (Al). pH, amount of adsorbent, adsorption time, desorption solvent, desorption time, adsorption capacity, pre-concentration factor, and interferences parameters were optimized for the analysis of thiram in matrices under optimum conditions.

The preconcentration factor (PF) of the method is 20. It was analyzed in HPLC-DAD system with thiram NH_2-MIL-53 (Al) adsorbent in the recovery range of 100.3-101.2 % in water samples and 80.8-97.2 % in fruit and vegetable samples. According to the results of the study, it is seen that MIL-53 can be used as a solid phase adsorbent in the determination of other pesticides for the environment and food matrices.

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OP – 25

Quantum Dots Coated with Molecularly Imprinted Polymer as a Phosphorescent Sensor for Selective Determination of Amoxicillin

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Amoxicillin is a semi-synthetic drug, which belongs to a class of antibiotics called the penicillin (β-lactam antibiotics). Beside its use in human medicine, amoxicillin is also used in the treatment and prevention of animal diseases. Mn doped ZnS phosphorescent quantum dots (QDots) capped with molecularly imprinted polymer (MIP) were synthesized by surface imprinting technique and used for the selective and rapid detection of amoxicillin from aqueous and organic medium. The combination of QDots and MIPs have created a fascinating horizon for the formation and observation of specific recognition cavities for different analytes in various matrix. This research demonstrated that phosphorescent signal of developed MIP-based room temperature phosphorescent (RTP) sensor could remarkably decrease with the addition of the analyte.

The MIP was synthesized using amoxicillin as a template, 3-aminopropyltrimethoxy silane (APTES) as a functional monomer, and tetraethoxy silane (TEOS) as a cross-linker. Non-imprinted polymer (NIP) was also prepared using the same method in the absence of the template. The calibration curve was obtained via Stern-Volmer equation based on quenching mechanism between modified QD particles and amoxicillin. The sensor exhibited distinct linear response ranges of 0.05 µg/mL – 3.00 µg/mL. Compared with structural analogues of the template, RTP sensor showed excellent selectivity for the analyte molecule. In short, a sensitive, rapid, simple, and selective analytical method was developed for the determination of amoxicillin in different matrices.

OP – 26

Simultaneously Determination 18 Organotin Compounds in Textile Wastewater with Simple Extraction Then Analyzing in GC/MSMS System

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Organotin compounds are using many widely applications such as antifouling agents, heat stabilizers in PVC and polymer production catalyst. Also, another utilization of these compounds is in textile industry due to biocidal properties that anti odor agent of final products. Therefore, these compounds may discharge in wastewater and dumping to aquatic environment then finally reach to marine ecosystem. The organotins are classified as persistent organic pollutant (POP) in European Directives.[1] The general aspect of the organotin analysis in wastewater includes liquid extraction following with evaporation, SPE (solid phase extraction) or column purification as described in ISO 17353:2004.[2] Also, in preliminary studies in the literature do not cover all organotin compound fractions, mostly studied was butyl- and phenyltins.[3,4]

That was observed in this study that at the evaporation stage, methyl, and propyl fractions of organotins in other words low molecular weight organotin compounds recoveries were decreasing (methyl mono, di, tri = 3.78–14.34 %; propyl di, tri = 56.32%, 44.93%). Additionally, if the column purification could apply, then recoveries would reach 1.19–5.97 % for methyl fraction; 28.16–32.72 % for propyl fractions. The rest of the other moieties of organotins (butyl, phenyl, heptyl and octyl) recoveries are between 68.76–133.74% in water spike. But, in textile wastewater matrix spikes recoveries are dropping as 5.56–30.08 % after column purification step. Textile wastewater is containing mostly pigments and inks also byproducts of chemicals and organic matters could be present. Due to high adsorption tendency of organotin compounds to organic matter, that is leading low recovery levels. However, the analysis methodology proposed in this study that textile wastewater sample applied the liquid extraction without evaporation and clean-up is possibly to analyze direct injection into large volume injection (LVI) with GC/MS-MS (Gas chromatography with triple quadrupole) systems. It could get satisfied recovery levels 102.32–133.12 % for methyl fractions and 96.62–106.21% for propyl fractions also the rest of other fraction recovery ranges are 95.10–134.20% even in matrix. Because of the selectivity on second ion fragmentation and high sensitivity, GC/MS-MS system can achieve in low ng levels in matrix spikes. The proposed methodology has presented that good linearity (r^2 > 0.98) and repeatability (<16.51%, n=3) for studied all organotin compounds. The acquired limit of detections is between 0.01–0.04 ng/L for 100 ml aqueous sample.

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OP – 27

Spectrometric Determination of Manganese in Spring Waters After Rapidly Synergistic Cloud Point Extraction

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In this study, the rapidly synergistic cloud point extraction (RS-CPE) method, which is an improved version of CPE, has been used instead of conventional cloud point extraction (CPE). Octanol has been used as synergistic reagent to reach the cloud point at lower temperatures, and thus increase the reaction rate. By using octanol, the study was carried out rapidly at room temperature or even at lower temperature without the need to heat the micelle-forming nonionic surfactant Triton X-114 in a water bath and without adding salt. Based on this method, spectrometric determination of the manganese (Mn) was carried out in Sivas hot spring water (HSW) and in cold spring water (CSW) after extraction.

Dithizone was used as a complexing agent in the RS-CPE method. The effect of pH, amount of surfactant, amount of complexing agent, amount of synergistic cloud point regulator and solvent species used to reduce the viscosity of the organic phase on extraction was investigated. After the RS-CPE method, the flame atomic absorption spectrometry (FAAS) of Mn in Sivas hot and cold spring waters was realized with the obtained optimum conditions.

Optimum conditions for Sivas hot spring water were found to be 7.00 for pH, 0.15% (v/v) for surfactant, 7.07×10^{-5} mol L^{-1} for complexing agent, 0.8 mL for synergistic cloud point regulator, methanol solution for solvent type (1.0 mol L^{-1} with nitric acid). At optimal conditions, matrix-compatible calibration was determined at a range of 2-120 µg L^{-1} with a selection limit of 0.56 µg L^{-1}. A sensitization improvement of 109.1 after enrichment resulted in an enrichment factor of 40 for the 40.0 mL sample. After the addition of 50.0 µg L^{-1} manganese to the matrix, the precision and recovery of the five replicate measurements were 3.15% and 97.2%, respectively. The soluble Mn concentration was 85.2 µg L^{-1} from the sample analysis performed under optimum conditions.

Optimum conditions for Sivas cold spring water were found to be 6.90 for pH, 0.18% (v/v) for surfactant, 8.08×10^{-5} mol L^{-1} for complexing agent, 0.6 mL for synergistic cloud point regulator, methanol solution for solvent type (1.0 mol L^{-1} nitric acid). Similarly, under optimum conditions, matrix-matched calibration was found at a range of 3–120 µg L^{-1} with a selectivity limit of 0.87 µg L^{-1}. After enrichment, a sensitivity improvement of 105.5 resulted in enrichment of 40 mL of sample, resulting in an enrichment factor of 40. After the addition of 50.0 µg L^{-1} manganese to the matrix, the precision and recovery of the five repetitive measurements were 3.8% and 96.5%, respectively. By analyzing the sample under optimal conditions, soluble free Mn was found to be 32.7 µg L^{-1}. The RS-CPE method applied in our study is advantageous in terms of speed, simplicity, low cost, and low interference probability.

OP – 28

Green Extraction of *H. lupulus* and Preparation of Environmental Friendly Biocide for Sugar Industry

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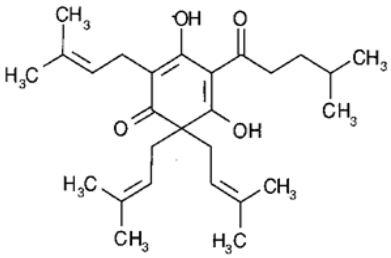
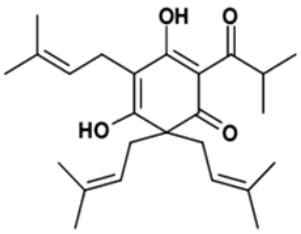
Hops (*Humulus lupulus* L.) is an important industrial plant due to production of pivotal constituents so-called α and β-acids. These compounds are known as humulones and lupulones where mainly produced by female inflorescences. Hops is employed for pharmaceutical industry due to its highly important bioactive components. On the other hand, it is also a good source for production of natural biocide to be used for food industry.

The aim of this study is to determine the bioactive components of these varieties and evaluate the possibility of production of a biocide for food industry. Especially sugar industry requires such natural biocides for the safety of its large-scale products. Therefore, extraction of bioactive compounds of Brewer's Gold and Aroma varieties grown in this part of world is aimed using green extraction method. Supercritical fluid extraction (SFE) method has been used to separate α-acids and β-acids. Following this, the identification of active principles and preparation of an effective biocide to be used in sugar industry was investigated.

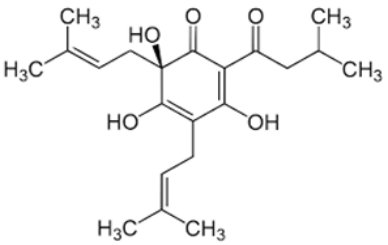
A series of SFE-CO_2 extraction process were set up: 100, 150, 200 and 250 bar pressure, 40 and 50 °C temperatures were applied for each pressure set (1.0 g/mL carbon dioxide density and 1 mL/min flow rate). Three extraction periods (1, 3 and 6 h) were tested to obtain the highest yield. The same procedure was used in the presence of ethanol as modifier solution. Its flow rate varied 0.5 mL/min and 1 mL/min at the same conditions given below. Following those extraction procedures, the crude extract was used for the preparation of α-acids and β-acid mediated natural biocide. As an environment friendly method SFE-CO_2 extraction is safe and do not require toxic chemicals for separation of bioactive compounds and production of a natural biocide.



Lupulone: $C_{26}H_{38}O_4$



Colupulone



Humulone: $C_{21}H_{30}O_5$

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OP – 29

Associating with Industrial Symbiosis of Industrial Ecology

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The concept of industrial symbiosis and industrial ecology is among the popular concepts followed with great importance by industrial organizations interested in sustainable clean technologies in recent years. Industrial ecology (IE) is the systematic approach of physical, chemical, biological relationships and interactions between both industrial systems and industrial systems with ecological systems. Industrial symbiosis (IS), on the other hand, is a collective approach intended for businesses to establish mutually beneficial partnerships by optimizing the use of resources (renewable raw material, energy, etc.) in industrial systems. While IE aims to increase the efficiency of interactions both within system and between systems, IS aims at cooperation between environmentally friendly industrial companies that produce in line with ecological principles.[1–2] Considering the origins of IE, IS focuses on innovative dynamism and networks for knowledge sharing to increase the efficiency of material and energy use beyond waste and by-product exchanges.[3] Therefore, IS and IE are directly related. In the case of industrial symbiosis, there is an improvement in environmental (ecological) and economic performance by taking advantage of the synergetic networks of geographically close companies, taking into consideration the step interactions of renewable raw materials and renewable energy, and in this case, it directly affects IE.[4]

In this review, the concepts of industrial symbiosis and industrial ecology have been examined in detail in all aspects and it has been determined that the relationship between them is a complementary relationship by contributing to each other.

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OP – 30

Environmental Applications of SPME and Related Techniques

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Sample preparation often is viewed as an impediment in chemical analysis. The success of the final analytical method strongly depends on the understanding of the entire process of the study of a particular type of sample and analyte. In this aspect, sampling and sample preparation using solid-phase microextraction (SPME) and related techniques are promising for on-site, in vivo, and high throughput laboratory analysis of challenging samples and analytes.

In this talk, the recent advances in environmental applications of various formats of SPME will be presented. Special attention will be given to in-vivo and in-situ applications of SPME for environmental monitoring with two different focuses, namely, targeted, and untargeted analysis. In this regard, the time-weighted average (TWA) concentration determination of analytes with a wide range of physical-chemical properties in environmental monitoring will be examined based on integrated SPME-based platforms. In addition, the capability of SPME for on-site sampling and on-site monitoring when portable instruments are available will be discussed. Final consideration will be given to in-vivo and in-situ applications of SPME for untargeted metabolomic investigation in the environment.

OP – 31

The Geomembrane Function of the Pedosphere

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Nowadays soils are becoming the focus of most global environmental problems, mostly due to the disregard for the geomembrane function of the pedosphere.

The soil is a thin-porous membrane that is constantly under the influence of temperature gradients. This causes the selective function of the soil in relation to gases of different molecular weights. The known phenomenon of relative thermodiffusion of gases leads to the movement of water vapor in the soil (M_{H_2O} 18) and carbon dioxide (M_{CO_2} 44) in opposite directions: water vapor in the heat flow, and CO_2 against the heat flow. That is why, with the moisture evaporation, the soil atmosphere is enriched with CO_2 and its daily cyclicity is observed. This process largely depends on the properties of soil porosity. It has been experimentally proved that soil moisture in the vapor state under non-isothermal conditions moves not by a thermodiffusion mechanism but by convective flows of soil air, which arise as a result of thermal sliding of gases in a porous medium. The "Method for determining the pore space of soils (dispersed media)" to characterize the porosity of the soil membrane has developed, which is based on the use of the phenomenon of capillary hysteresis. This method has become a sensitive tool for studying the patterns of epigenetic variability of the pore space structure (PSS) of soils in real-time under the influence of various factors. The mechanism of PSS reforming under the action of homeostatic processes, which arise as a result of thermodynamic interaction of soil with cyclic flows of thermal energy, was investigated. The concept of soil homeostasis is formulated. The change in the level of homeostasis leads to a change in its PSS. An important role in this process belongs to the increased CO_2 content in the soil atmosphere. From the point of view of synergetics, the soil is a thermodynamically nonequilibrium dissipative system with a microgradient structure. A special role in this structure belongs to macropores, which become centers of thermodynamic imbalance, acid centers, and centers of ecotones of soil biota. Homeostatic self-organization of the soil, according to Le Chatelier-Brown's principle is aimed at limiting the penetration of external perturbations into the system. The humid climate is characterized by the formation of weakly permeable illuvial (podzolic, gleyed, etc.) horizons in the one-meter of the soil profile. In automorphic conditions of a balanced amount of heat and precipitation, a developed structural macroporosity in soil is formed, which minimizes the thermal and mass conductivity of the aeration zone but increases the energy efficiency of the soil.

The planned inhomogeneity of the conditions of self-organization forms spatially inhomogeneous geomembrane properties of the soil cover in relation to the flows of moisture, migration of matter, and pollution. It is necessary for now to initiate the international program for in-depth study of soil geomembrane properties in the context of global climate change.

OP – 32

Full Paper

Sonocatalytic Decomposition of Organic Pollutant Under Visible Light Over Graphene-Based NiCr Layered Double Hydroxide

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Abstract
In this research, graphene-based NiCr LDH (NiCr LDH@rGO) was prepared and its characteristics were checked by the different analyses. SEM analysis was used to study the morphology of so-synthesized nanocomposite. The successful synthesis of the catalyst was well confirmed by EDX and XRD analyses. Moreover, the catalytic performance of the NiCr LDH@rGO was evaluated for the degradation of Rifampicin (RIF) as a kind of organic pollutant. The prepared nanocomposites demonstrated superior activity during the sonophotocatalytic process within 90 mins. Moreover, the role of the reactive oxygen species (ROSs) was specified by utilizing the different kinds of scavengers. Furthermore, the durability of NiCr LDH@rGO is determined and the degradation efficiency didn't reduce significantly after four consecutive runs. Ultimately, to the best of our knowledge, NiCr LDH@rGO with sonophotocatalytic activities toward RIF has not been reported so far.

1. Introduction

Recently, water paucity has become a main concern worldwide owing to urbanization and population growth.[1] The removal of emerging contaminants (ECs), such as pesticides, pharmaceuticals, personal care products, and so on, has been studied in the field of water recycling by diverse research groups all over the world. Antibiotic-containing wastewaters, such as RIF, represent chronic toxicity caused by the rise of bacterial resistance to antibiotics in which the world health organization (WHO) warns about it.[2]

To prevail on this issue, water demand for some applications can be provided through suitable treatment methods. The advanced oxidation processes (AOPs) such as photocatalysis, sonocatalysis, Fenton, and so on are well known as notable and efficient ways for the degradation of refractory organic pollutants including pesticides, pharmaceuticals, etc.[3]

Moreover, by the combination of AOP processes, the degradation efficiency improved, and the treatment cost decremented. Sonophotocatalysis, which combines sonication and photocatalysis, has received a lot of attention as an effective integrated method for the degradation and removal of organic pollutants. When these processes are combined, a large amount of reactive radical species, such as hydroxyl radicals, are produced, which improves mineralization and degradation rates.[4]

The semiconducting feature of some layered double hydroxides (LDHs) makes them proper catalysts to be used in AOPs.[5,6] LDHs have recently gained popularity as catalysts due to their high anion exchange capacity, large specific surface area, and simple synthesis. They are anionic clays with the formula $[M^{II}_{1-x}\ M^{III}_{x}(OH)_2]^{x+}\ [A^{n-}]_{x/y}.\ yH_2O$, where M^{II} denotes divalent cations (Cu^{2+}, Ni^{2+}, Mg^{2+}, Zn^{2+}, etc.) and M^{III} denotes trivalent cations (Fe^{3+}, Al^{3+}, Cr^{3+}, etc.). Nonetheless, owing to poor charge carrier mobility, rapid recombination of photo-induced charges, and lower electron-hole transfer, bare LDHs typically have lower quantum yield when

exposed to ultraviolet and visible light. The performance of LDHs can be significantly improved by a variety of modifications such as doping, combination with the different types of semiconductors, and immobilization on the proper substrates. Reduced graphene oxide (rGO) has recently attracted a lot of attention due to its widespread use in environmental remediation processes. Besides, the chemical stability, electrical conductivity, and mechanical strength of graphene-based materials make them a promising candidate for hybridizing with LDHs to produce nanocomposites.[7]

To the best of our knowledge, there is not any systematic research on the use of graphene-based NiCr LDH for the sonophotocatalytic decontamination of refractory contaminants. Hence, in the present study, the successful synthesis of NiCr LDH@rGO is reported and the characteristics were analyzed using XRD, SEM, and EDX techniques. Then, the sonophotocatalytic activity of the prepared sample in the degradation of RIF as the target antibiotic pollutant under visible light irradiation was evaluated. The impact of different scavengers and the durability of NiCr LDH@rGO were explored.

2. Materials and Methods

All the chemicals were procured from Merck, Germany. In order to synthesize NiCr LDH@rGO, 0.08 g of GO solution was dispersed well in distilled water. NaOH solution was added to the $Cr(NO_3)_3.9H_2O$ and $Ni(NO_3)_2{\cdot}6H_2O$ solutions and the pH was raised to 9. Then, the solution was mixed with the GO solution, stirred, and transferred into a stainless-steel autoclave. The autoclave was placed in the oven at 90 °C for 24 h. The obtained precipitate was washed with deionized water and dried.

3. Results and discussion

SEM analysis was applied to assess the morphology characterization of the NiCr LDH@rGO (**Fig. 1a**). As can be seen, the layered crystal structure of NiCr LDH can be formed on the surface sheets of the rGO which is confidently asserted the successful synthesis. The presence of Ni, Cr, O, N, and C in the catalyst structure of NiCr LDH@rGO is confirmed well through EDX analysis (**Fig. 1b**).

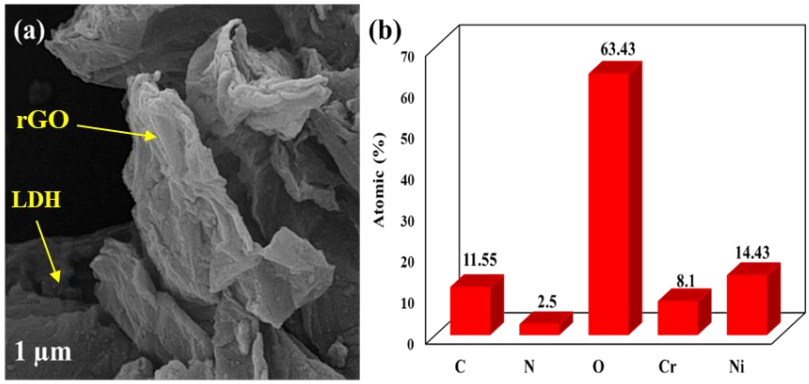

Fig. 1. (a) The SEM image and (b) The EDX analysis of NiCr LDH@rGO.

The XRD spectrum of the catalyst is illustrated in **Fig. 2**. XRD pattern of NiCr LDH@rGO fitted well by the existence of diffraction peaks at (003), (006), (012), (015), (018), (110), and (113) (JCPDS PDF- 96-210-2794) [3]. The XRD pattern approved the successful synthesis of NiCr LDH@rGO. Owing to the low amount of rGO in the nanocomposite structure, the characteristic bands of rGO were not observed in the XRD patterns.

The efficiency of the diverse processes is shown in **Fig. 3**. The enhancement in sonophotocatalysis can be related to the light radiation in the presence of ultrasonic waves which can provide a synergistic effect by the generation of highly reactive free radicals such as hydroxyl radicals (˙OH).

ROSs-trapping tests were performed by adding diverse scavengers to discriminate their roles in the sonophotocatalytic degradation of RIF. The presence of all scavengers decreased the degradation efficiency,

however, the most noticeable outcomes were obtained with the use of hydroxyl and hole scavengers. The observations affirmed the roles of hydroxide and superoxide radicals as well as holes as the key species in RIF decomposition over NiCr LDH@rGO nanocomposite.

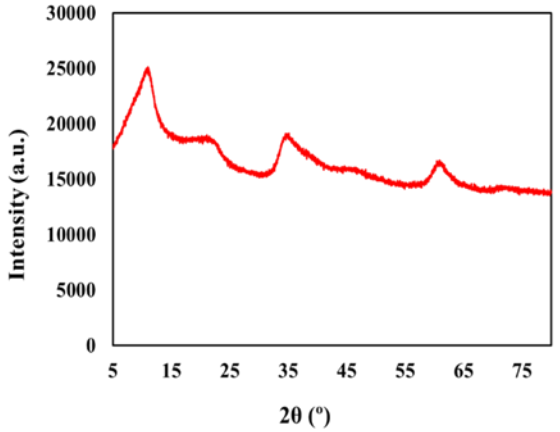

Fig. 2. The XRD pattern of NiCr LDH@rGO.

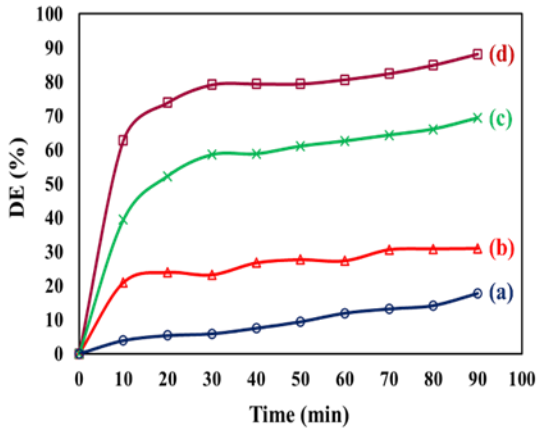

Fig. 3. Comparison of the degradation efficiency of RIF in the different processes (a) adsorption, (b) photocatalysis, (c) sonocatalysis, and (d) sonophotocatalysis. (pH =8, [RF] = 15 mg/L, catalyst = 0.75 g/L, ultrasonic power = 150 W, and visible light).

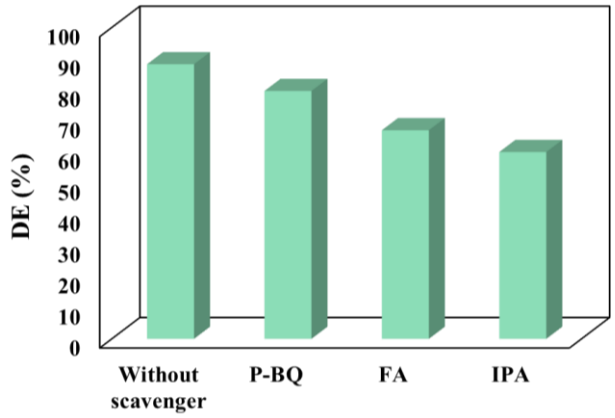

Fig. 4. The impact of diverse scavengers. (pH =8, [RF] = 15 mg/L, catalyst = 0.75 g/L, ultrasonic power = 150 W, and visible light).

4. Conclusion

The XRD, SEM, and EDX techniques were used to investigate the structural and chemical properties of NiCr LDH@rGO. The sonophotocatalytic property of the prepared nanocomposite was evaluated by the degradation of RIF as an emerging contaminant. The degradation efficiency of 88.2% was assessed using 0.75 g L^{-1} of NiCr LDH@rGO as sonophotocatalyst at 15 mg L^{-1} of RIF, and an ultrasonic power of 150 W within 90 min of reaction under visible light irradiation. The addition of diverse scavengers revealed that hydroxyl radicals and superoxide anion radicals and the generated holes are the dominant reactive species in the sonophotocatalytic degradation of RIF.

Acknowledgment

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OP – 33

Glutathione S-Transferase Activity during Phytoremediation of 2,4-Dichlorophenol (2,4-DCP) in Some Wild Plants

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Glutathione S-transferases (GSTs) play important roles in many different events, including the detoxification of xenobiotics, herbicides, and pesticides, as well as enhancing stress tolerance in plants[1]. 2,4-Dichlorophenol (2,4-DCP), an extremely toxic chlorophenolic, is one of the toxic environmental pollutants used as a raw material in many industries, including most herbicide and insecticide production[2].

This study investigates the response mechanism of GST during phytoremediation of 2,4-DCP in *Datura stramonium*, *Amaranthus retroflexus*, and *Sinapis arvensis* plants with high phytoremediation potential, exposed to different doses of 2,4-DCP. The seedlings growing in a hydroponic system were exposed to the different solutions of 2,4-DCP in a concentration range from 75 to 275 ppm for 4 days. Then, GST activity was evaluated spectrophotometrically in roots and shoots of seedlings. GST activity in roots and leaves of *D. stramonium* increased up to 125 ppm dose of 2,4-DCP but decreased at its 150 ppm and higher doses, compared to control. Even at 275 ppm, its highest dose, the activity decreases were 13% in leaves and 17% in roots. In *A. retroflexus*, GST activity increased up to 175 ppm dose of 2,4-DCP in the leaves and 125 ppm in the roots, but after these doses, its activity in both organs generally decreased in parallel with the increasing doses of 2,4-DCP. The highest decreases in GST activity were 20% in the leaves and 28% in the roots. In *S. arvensis*, on the other hand, all the doses of 2,4-DCP decreased GST activity in parallel with the increasing doses in both leaves and root, compared to their controls. In addition, the highest decreases in GST activity were 44% in the leaves and 80% in the roots. Our results show that of these 3 plants studied, *D. stramonium* and *A. retroflexus* plants responded to 2,4-DPC toxicity by stimulating GST activity, especially at low concentrations.

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OP – 34

Novel Filtration System to Reduce the Water-Pipe (Nargileh) Toxicity, Chemical and Biological Evaluation

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Water pipe (nargileh) smoking is highly prevalent in developing countries, especially in the Eastern Mediterranean countries. It has been claimed that more than 100 million people smoke Water-pipe. Tobacco smoking is one of the leading behavioral factors related to an increased risk of cancer, one of the leading causes of death globally. This study aimed to innovate a novel filtration system for water-pipe smoke and evaluate the cytotoxic effect of common water-pipe condensed smoke in comparison with the novel filtration system on normal (HEK293t) and cancer cell lines (Hep3B and MCF7) by MTS assay, alpha-fetoprotein (aFP), and apoptosis/necrosis effects. Furthermore, the smoke substituents' neurotoxicity effect was evaluated by analyzing the depressive property on AMPA receptors (AMPARs). The results proved that water could filtrate toxins, and by introducing silica filtration system we were able to reduce the quantity of toxic compounds from 145mg in distilled water extract (**DWE**) to 57.5 mg in silica solution extract (**SSE**). However, the **SSE** showed lower toxicity on different cell lines HEK293t Hep3B and MCF7 with CC_{50} values 149.9, 10.14 and 8.9 µg/ml, than **DWE** CC_{50} values 77.1, 3.1, and 5.24 µg/ml, respectively, as well as **SSE** reduced the α-FP to 2273.3 ng/ml which is closer values to untreated cells (4066.7 ng/ml) in comparison with **DWE** which reduced it greatly to 1658.7 ng/ml, and the biophysical properties of AMPAR subunits demonstrate a reduced effect on desensitization rates of GluA2 homomer and GluA1/2 heteromer, using **SSE** relative to **DWE.** In conclusion, the condensed smoke of ordinary water pipe (**DWE**) has cytotoxic and neurotoxic impacts on various cell lines, while our newly developed system (**SSE)** was less toxic [1].

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OP – 35

TiO_2/CDs Modified Reverse Osmosis Membrane for Simultaneous Enhancement of Antifouling and Chlorine-Resistance Performance

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As time elapses, the water famine phenomenon arisen from industrialization, climate fluctuations, contamination, and population increment, is an imperative consideration of humankind, albeit 70% of the earth is covered by water. Water treatment and reuse technologies have been emerged to overcome water scarcity.[1] Reverse osmosis (RO) desalination is a highly preferred and effective method for wastewater reuse and replenishment of water resources.[2] However, the antifouling and chlorine resistance of the RO membranes should be improved.

In this study, a TiO_2/CDs hydrophilic nanocomposite photocatalyst with different contents was embedded in polyamide layer of RO membrane via interfacial polymerization to increase desalination performance and antifouling properties. The modified membranes showed smoother surfaces with reduced contact angles, causing to improve membrane fouling resistance. TiO_2/CDs nanocomposite, due to its photocatalytic activity, showed more flux recovery ratio (FRR) after irradiation of UV light during the washing process. The *FRR* was enhanced from 94.4 to 97.1% for 0.01 wt% TiO_2/CDs RO membrane by UV irradiation. The hydrophilic functional groups with negative charge increased the desalination efficiency of the modified membranes (99.2% NaCl rejection for 0.01 wt% TiO_2/CDs membrane). The membrane containing 0.01 wt% TiO_2/CDs presented the highest pure water and NaCl solution flux of 59.6 and 54.6 L/m^2.h at 15 bars, respectively. In addition, the used nanoparticles improved the chlorine resistance of the membranes.

As a result, TiO_2/CDs nanocomposite with very low amounts could be applied as a suitable nanofiller to increase the permeability, antifouling properties, and chlorine resistance for RO membrane modification.[3-5]

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OP – 36

Investigation of Water Quality Values of Lake Gazivoda (Republic of Kosovo)

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The Republic of Kosovo declared its independence on February 17, 2008, it's management plans for most of the country's natural resources are still under preparation. Therefore, increasing scientific knowledge about water resources in the country will make the plans to be made more accurate and efficient and will accelerate the development.[1-2]

In this context, this study is considered to be an example for other scientific studies to be planned in the future in the Republic of Kosovo. From this point of view, it is also important to evaluate existing water resources as the most rational in terms of fisheries.[3-4]

This study was carried out in the Gazivoda Lake, which is important for water resources, ecology, and aquaculture of the Republic of Kosovo. Between March 2019 and February 2020, Gazivoda Lake has been carried out at 7 strategic stations to determine the current status of water quality. Some physico-chemical parameters in the water samples taken; Water temperature, pH, dissolved oxygen, electrical conductivity, salinity, nitrite nitrogen, nitrate nitrogen, ammonium nitrogen and total phosphorus were examined both seasonal and monthly for a year.

Analyzes of water samples taken from selected stations were carried out at the Hydro-Geogioni Jugor Institute of Republic of Kosovo accredited Water Analysis Laboratory. According to the analysis results obtained, Gazivoda Lake, which is in its natural structure during the winter months, was under the influence of intense tourism activities around June-August.

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OP – 37

Determination of the Relationship Between Abundance of Industrial Facilities and Quality of Ecosystems Using the Macrobenthic Invertebrate Biodiversity in Dil Creek (Dilovası District-Kocaeli-Turkey)

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Benthic macroinvertebrates are invertebrates known as larger than 0.5 mm aquatic organisms. Since they have cosmopolitan nature, easy sampling procedure, limited movement needs, long life cycle, and heterogeneous living in communities in their regions, their biodiversity has long been used as a tool for understanding the ecological quality of aquatic ecosystems. They are also sensitive to pollution sources and may be used as indicator organisms. In the present study, a biodiversity-based ecological quality assessment approach was used and the ecological status of the Dil Creek, located in a densely industrialized region, was determined using BMWP and Shannon-Wiener (H') metrics considering benthic macroinvertebrates biodiversity and abundances. Also, correlations between the quantity of these organisms (at the levels of biodiversity of taxon, family, and higher categories) and the abundance of industrial facilities in the Dilovası District (Kocaeli-Turkey) which is known as one of the most polluted areas in Turkey, were assessed.

Benthic macroinvertebrate samples were collected using a Van-Veen type grab and hand net samplers at 3 stations located at the head of the river, the middle point, and estuary throughout the Dil Creek during spring (May 2019) and autumn (November 2019) seasons. Identifications were performed by Olympus ZX24 stereo and Olympus CX23 binocular light microscopes using identification keys suitable for benthic macroinvertebrate groups. In determining ecological quality ratios, Biological Monitoring Working Party (BMWP) and Shannon-Wiener indices were used to evaluate family and taxon biodiversity, respectively. Pearson correlations (one-tailed) were used to determine correlations between industrial facility abundances and biodiversity of macrobenthic invertebrates for both seasons.

In total, about ninety macrobenthic invertebrate species were identified in the stations, with the present study. The data indicates that the biodiversity and abundances of benthic macroinvertebrates decreased from the head of the river to the mouth of the river in accordance with the increased industrial facility numbers. Although the highest biodiversity metrics (H') calculated at the middle station, where located in a recreational area, the BMWP metrics, which evaluate the macrobenthic invertebrates' quality at the family categories, reached the highest levels at the station, located at the head of the river, in both seasons. Also, both metrics had their lowest values at the mouth of the river. The significant negative correlations were determined both at taxon levels and at higher taxonomic groups (i.e., $r=0.99$, $p<0.05$) with the increased number of industrial facilities. Therefore, the obtained data indicates deterioration of the macrobenthic invertebrate communities through the Dil Creek, and it is thought that industrial activities have a damaging effect on the quality of freshwater ecosystems and the macroinvertebrate biodiversity in the region. All kinds of industrial and domestic discharges occurring in the region should be treated and/or the existing treatment technologies should be improved.

OP – 38

Adsorptive Removal of Potential Ecotoxicological Active Antibiotic Ingredients from Aqueous Solution by Activated Carbon

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According to World Health Organization (WHO) current data, Turkey ranks first among OECD countries as the highest country for antibiotic resistance.[1] The emergence of resistant bacterial mutants and these resistance genes can transfer to other bacteria poses a high risk.[2] Hence, it is essential to prevent the contamination of natural water resources with antibiotic drug active ingredients for Turkey. These micropollutants are not removed by conventional treatment methods in the wastewater treatment plant; therefore, it is necessary to use appropriate removal methods. Adsorption is one of the most suitable treatment options due to its lipophilic structure and low biodegradability.[3-4]

The present work investigates the removal performance of Amoxicillin (AMX), Ciprofloxacin (cfH), and Oxytetracycline (OTC) antibiotics by active carbon from aqua solution and these substances ecotoxicological effects. The aqua solutions containing active ingredients with varying concentrations were prepared by diluting stock solutions (from 1000 mg. L^{-1} to 50 mg. L^{-1}). The optimized conditions for the adsorption process were carried out using active carbon dosage 0.5g: 50 mL at five different pH values (2-8) and an agitation rate of 250 rpm for 30 minutes at ambient temperature. The process's kinetics was studied using Pseudo 1st order and Pseudo 2nd order kinetic models. The experimental data is best fitted with Pseudo 2nd order. The highest removal efficiencies were calculated as AMX= 90.9% and cfH= 87.6% at pH 7 and OTC= 78.8% at pH 4. Finally, the potential risk of the selected antibiotic was evaluated in risk quotient (RQ) calculation in terms of persistence, bioaccumulation, and toxicity. The most ecotoxicological among AMX was the highest risk due to its high PEC: PNEC ratio for Turkey.

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OP – 39

Removal of Heavy Metals by Adsorption Using Natural Moroccan Clay

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The removal pollutants from water are an important process and is becoming more important with the increasing of industrial activities. Therefore, removal of heavy metals such as cadmium, lead, nickel, chromium, iron, zinc, and copper from aqueous solution is necessary because of the frequent appearance of these metals in liquid waste of many industries. The heavy metals can be readily adsorbed by marine animals and directly enter the human food chains, thus presenting a high health risk to consumers.

Different techniques for the removal of metal ions from aqueous solutions have been developed as chemical precipitation, filtration, ion-exchange, reverse osmosis, membrane systems, etc. However, all these techniques have their inherent advantages and limitations in application. In the last few years, adsorption has been shown to be an alternative technique for removing dissolved metal ions from liquid wastes.

In this study a natural Moroccan clay were used as adsorbent material for the removal of Cd(II) and Pb(II) from solutions. The effect of various parameters affecting adsorption behavior as contact time, initial metal ion concentration, amount of adsorbent, and temperature of solution have been investigated. Reaction kinetics, thermodynamic parameters and adsorption isotherm model are studied. All the results are presented and discussed

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OP – 40

Comparison of Tropical Rainfall Measuring Mission (TRMM) Multi-Satellite Precipitation Analysis (TMPA) Products with Gauge-Based Data over Turkey

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Precipitation washout is one of the major mechanisms for removal of particulate pollutants in the air. Therefore, accurate precipitation estimates are great importance not only for hydrometeorological studies but also air quality management strategies. For this reason, this study investigates the evaluation of Tropical Rainfall Measuring Mission (TRMM) Multi-Satellite Precipitation Analysis (TMPA) products with gauge-based precipitation (GBP) data over Turkey. For comparison, daily TMPA precipitation products (0.25ºX0.25º grid resolution) were compared with 1035 ground-based stations of Turkey for the period 2015-2019. In order to investigate topographical and regional effects on precipitation mechanism, precipitation data of clustered meteorological stations, according to their altitudes [Low-Level Stations (LLS):0-100m, Mid-Level Stations (MLS): 101-500m, High-Level Stations (HLS): 501-1000m, Mountain Stations (MS):>1000m], were compared with TMPA 3B42 V7 products for seven geographic regions [Marmara Region (MR), Aegean Region (AR), Mediterranean Region (MeR), Central Anatolia Region (CAR), Black Sea Region (BSR), Eastern Anatolia Region (EAR), Southeastern Anatolia Region (SEAR)].

According to the results, TMPA products overestimate the observed precipitation for all regions during spring and fall seasons. In winter, TMPA overestimates (underestimates) the observed precipitation in AR, BSR, and CAR (MR, MeR, EAR, and SEAR) regions. In summer, TMPA precipitation totals appear to be less than observed values in all regions, except CAR. In evaluation statistics, highest seasonal correlation (r) between TMPA and GBP were found during spring (0.95), fall (0.94), summer (0.93), and winter (0.91) seasons, respectively. It was shown that these correlations are higher in the coastal areas of MR, AR, MeR regions, when compared to their high-altitude stations. On the other hand, highest TMPA-GBP correlations were found in the high-altitude stations (HLS and MS) of the CAR and BSR when compared to their low altitude stations. In daily statistics, highest correlation coefficients (r) were found in low altitude stations of AR (LLS: 0.53, MLS: 0.54) and MeR (LLS:0.50) during fall and followed by MS of EAR (0.46) and MeR (0.43) in summer, and coastal stations of MeR (LLS: 0.43, MLS: 0.44) in winter.

OP – 41

The Effect of Climate Change on the Fishing Ports in the Eastern Black Sea

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The total landing of the Turkish marine fishes is about as reported 375 thousand tonnes in 2019, of which 70% is anchovy. The Turkish Black Sea fisheries are highly dependent on these small pelagic fish stocks. Understanding the biology and behavior of this species as well as the factors affecting the marine environment and hence the management of living resources are crucial for sustainable fisheries. This is also essential to boost the economic income without interrupting the blue growth. The Eastern Black Sea fish landing ports get around 50% of the total land, and most of this (~40%) is landed only at three, Yoroz (Trabzon), Fındıklı (Rize), and Hopa (Artvin). However, due to an increase in the rainfall during the last two decades, notably during the last couple of years, loading the ports have increased, and that needs to be re-formulated for the fishing, and necessary measures should be taken if needed, and hence blue growth in the fishing community is not to be interrupted. Therefore, the core action here is to collect and study the relevant hydrological and meteorological observations data, topographic and bathymetric maps, and other materials to process and classify the obtained data on geomorphological changes and Port Modelling.

We will give an example to show how sediment movement is affecting the fishing ports and what advice can be provided for the ports management authorities.

OP – 42

The Trophic Status Assessment of İzmit Bay (the Marmara Sea) Simultaneously with the Mucilage Formation Using Phytoplankton Biodiversity and TRIX

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In the present study, nutrient concentrations, and phytoplankton biodiversity of the İzmit Bay were investigated to assess the water quality and trophic status of the ecosystem. The water and phytoplankton samples were collected in total four stations. The samples were taken from the north coasts of the İzmit Bay in three stations located at the Dil Creek offshore, eastern basin, and central basin, in February, April (simultaneously with the mucilage formation), and September 2021, respectively. Also, a sampling was done in Tuzla offshore in January 2021 to compare and evaluate the data.

Temperature, salinity, dissolved oxygen levels were measured in situ. Seawater samples were taken by Nansen Bottle from the surface, 5m, 10m, and 15m depths where available. For chemical analysis, the samples were kept cool, and dark and immediately transported to the laboratory. Orthophosphate, inorganic nitrogen, and chlorophyll-*a* concentrations were analyzed spectrophotometrically. In total 52 phytoplankton species (31 Bacillariophyceae-BAC, 19 Dinophyceae-DIN, and 2 Dictyochophyceae-DIC) were identified during the study. BAC diversities were dominant in all stations and all depths. The highest phytoplankton biodiversity was determined in the Tuzla station with 33 taxa at the surface water, whereas the highest cell abundance was determined in Dil Creek offshore. The highest DIN/BAC rate was calculated in the Central Basin station; accordingly, the limiting factor was nitrogen during the study and the period that the mucilage formation was observed. *Pseudo-nitzschia* sp., *Skeletonema costatum, Thalassiosira rotula, Dinophysis acuminata, Dinophysis caudata, Gonyaulax spinifera,* and *Prorocentrum micans,* are known as the mucilage-secreting organisms, were found in the samples. Amongst them, *Skeletonema costatum* was present in all stations and depths throughout the study. The average TRIX values through the water column of the stations indicated that the condition was eutrophic in Dil Creek offshore and ecological qualities were described as BAD for all depths in the station. Also, high eutrophication risks were present in all stations located in the İzmit Bay. Although the lowest TRIX value was determined in the Tuzla station, eutrophication risk was also present at the surface water of the station.

Considering the obtained data, it is thought that untreated and/or insufficiently treated discharges, particularly nutrient loads have negative effects on the İzmit Bay ecosystem. Effective measures such as advanced wastewater treatment plants establishment, reuse of wastewater, and deployment of nutrient monitoring stations, should be taken to prevent damaging future events around the İzmit bay.

OP – 43

Qualitative Detection of Food Contaminants by Mobile Phone

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Environmental pollutants are increasing in every field in nature with the development of industry and technology. Due to its economic value, agriculture and livestock are also affected by these pollutants. In food industry these chemical residues can make foods unconsumable, decrease the quality of products or harm human health. Pesticide residues, heavy metal accumulation and antibiotic residues can be listed as some important examples of contaminants in foods[1].

As a result of the uncontrolled use of antibiotics in the sick animals, antibiotic residues are encountered in the milk for a certain period of time. These antibiotic residues can harm human health, environment, affecting natural processes, biodiversity, soil life and cause serious damage to dairy enterprises economically[2]. Milk samples should be tested whether it contains antibiotics or not before admitted by companies. For this reason, rapid qualitative analysis kits are needed to be used in the field.

The features and equipment of our mobile phones are developing day by day. In this study, it was aimed to produce a test kit that could detect antibiotic residues in milk samples simply with a mobile phone. A mini potentiostat chip, which can be used with phones and tablets, was used for electrochemical detection. Application for mobile devices were developed with help of method script language for android operation system. Single use screen printed electrodes were produced and then modified with antibodies. Competitive Enzyme-Linked Immunosorbent Assay (ELISA) method was used for detection. Beta-lactam antibiotic, Amoxicillin was used as target analyte. Qualitative detection was successfully operated in milk samples.

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OP – 44

Drug Analysis in Wastewaters in Erzurum

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As a result of the increase in diseases in the world and in our country, there has been a significant increase in the use of medical drugs. Studies conducted by Health Organizations have found that more than half of the drugs used are not prescribed, distributed, or sold inappropriately. In addition, half of the patients stated that they did not take or use the drugs they used as specified. As well as impacting negatively on individual health, and resulting in extensive resource waste, pharmaceutical use – and "misuse" – can have significant adverse repercussions on wildlife and ecosystems, particularly when unused medicines are disposed of inappropriately[1]. An ageing demographic, the rise of chronic health conditions, the availability of inexpensive generic treatments, and the advent of "lifestyle" drugs have been the key drivers of increased pharmaceutical medicine use within the European Region and our country. Medicine use for preventive purposes is also now commonplace in some countries, with biomarkers used to assess risks often resulting in medicine use, even when health risks are relatively low[1,2].

While the health and economic benefits of pharmaceutical developments are widely acknowledged, unused drugs are inappropriately dumped into the environment. Pharmaceuticals thrown into the environment affect the natural world more and more [1,2].

Pharmaceuticals have been found mainly in surface waters such as lakes and rivers, but also in groundwater, soil, manure and even drinking water. Pharmaceuticals have been found mainly in surface waters such as lakes and rivers, but also in groundwater, soil, manure and even drinking water. There are two main routes by which active pharmaceutical ingredients used within human medicines enter the environment. First, when medicines taken are excreted in urine or faeces; and second, when unused medicines are thrown down the toilet, sink or gabrage. In both cases, medical pharmaceuticals end up in sewage treatment plants that are generally not designed to remove such pollutants from wastewater. Waste from drug production discharged into surface waters may harm aquatic life, can potentially contaminate the meat of cattle, which can affect the human food chain, and could further spread hazardous substances into the soil and waterways[1–4].

It is very important to determine drug concentrations based on direct concentration measurements of the drug of interest (or its metabolites) excreted in the urine in untreated wastewater samples. In this study, it was aimed to develop and validate a method for the determination of antibiotics in wastewater.

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OP – 45

Preparation and Characterization of Zn-TiO_2/POSS-CI_4 Nano-Hybrid Material and Evaluation of Photocatalytic Activity

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Water pollution is predominantly the biggest challenge along with air pollution in the 21st century. Water pollution is largely caused by a variety of industrially discharged, untreated effluents such as toxic heavy metals, dyes, pesticides, antibiotics, etc.[1,2] Dye industries, in particular, have grown over the century to become one of the most profitable sectors. However, the discharge of untreated azo dye waste in water bodies (up to $7x10^{-5}$ tons every year) owing to their stable aromatic structure, does not undergo photodegradation, which results in its accumulation, causing poisoning of the aquatic organism.

Several water treatment methods such as ion exchange, membrane separation and coagulation-flocculation, adsorption and advanced photocatalytic oxidation process (AOP) have been tested so far. Advanced photocatalytic oxidation process using semiconductor photocatalyst has emerged as the most promising solution. Various transition metal oxides have been synthesized so far for photocatalytic degradation of organic pollutants. TiO_2 is one of the most widely used semiconductors. TiO_2 is bright and has a very high refractive index, among the highest available in nature. Furthermore, it is easily available, relatively inexpensive, harmless and chemically stable.

In this study, Zn-TiO_2 was synthesized by the sol gel method. A new hybrid material was prepared by adding POSS-CI_8 to Zn-TiO_2 in order to add advanced properties such as advanced thermomechanical properties, good thermal stability, atomic oxygen resistance, abrasion resistance and low water uptake.[3] The prepared Zn-TiO_2/POSS-CI_4 NPs were characterized by XRD, SEM-EDX, FTIR, XRF, BET, particle size distribution, zeta potential measurement, band gap energy, DTA-TGA analysis. Photocatalytic performances of the nano hybrid material under both UV and visible light were tested on 25 mg/L methylene blue, photocatalytic degradation percentages were determined by UV-Vis spectrophotometer. As a result of total organic carbon (TOC) analysis and UV-Vis spectroscopy analysis 99.02% methylene blue was degraded under UV-C light in 60 min, whereas 97.31% of methylene blue was degraded under visible light in 150 min.

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OP – 46

The Embryotoxicity of Alpha-Pinene to the Early Life Stages of Zebrafish (*Danio rerio* Hamilton, 1822)

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Alpha-pinene (AP), produced by pine trees and other plants, is used as a scent and flavoring agent. Exposure to this compound has been known in the personal care, use of household cleaning products, and the lumber industry. On the other hand, despite widespread exposure, toxicity data for AP are limited.[1]

The aim of this study was to determine the embryotoxic effects of AP on zebrafish (*Danio rerio*) embryos with fish acute toxicity test.[2] To investigate the potential embryotoxicity of AP, 1.5 hpf zebrafish embryos were exposed to different concentrations of AP (20, 40, 80, 160, 320, and 640 mg/L). Exposure was maintained for 72 hours. 72-hour LC_{50} and EC_{50} values were determined for AP. The LC_{50} and EC_{50} for AP were 441.360 mg/L and 367.795 mg/L, respectively. The embryos are not much affected by AP until hatching. In addition, AP showed teratogenic effects at high doses (320 and 640 mg/L). Typical lesions were absence of somite (≤48 hpf), lordosis, yolk sac deformity, tail abnormality, cardiac edema, and eye shrinkage (≤ 72 hpf). However, survival rates of zebrafish embryos in the 20, 40 and 80 mg/L AP groups were greater than 80% during the exposure period. In addition, very low teratogenicity for zebrafish embryos was observed in the 160 mg/L AP group. Our findings show virtually no embryotoxicity and teratogenicity at 20 and 40 mg/L AP concentrations. No developmental delaying was observed. Therefore, AP can be considered a safe compound in the concentrations.

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SOP – 1

Green Synthesis of Nanoceria and its Application as a Catalyst for Degradation of Methylene Blue

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Nanomaterials are employed in many areas due to their excellent surface and spectral properties. In this study, a different feature of nanomaterials was focused to develop a new fast, cheap, and environmentally friendly method to remove methylene blue (MB) in aqueous medium. Nanoceria is a typical oxidase- and peroxidase-mimic metal oxide (nanozyme) that can effectively degrade recalcitrant organic contaminants with or without the action of hydrogen peroxide. In this regard, zahter, known as wild thyme (Thymbra spicata L. var. spicata)-coated nanoceria (ZCNC) particles were produced using a green synthesis route and characterized by SEM and FTIR analyses. This type of nanoceria is proposed as an alternative catalyst that can work without the need of UV light or ultrasonic treatment and additional oxidants such as H_2O_2 that cause the degradation of methylene blue in aqueous medium.

In this work, Fenton-type reaction, possible combinations of UV light, H_2O_2 and nanoceria were tested to accomplish methylene blue (MB) degradation; nanoceria particles could effectively degrade MB in acidic conditions. The efficiency of degradation was spectrophotometrically monitored at 664 nm which is the maximum absorption wavelength of MB. The maximal conversion efficiency of MB under the test conditions was observed with the zahter-coated nanoceria in acidic medium. In addition, several parameters such as removal percentage, recovery of the used nanomaterial, catalytical effect of nanoceria, type and amount of acid to achieve the desired acidic medium were studied in detail.

SOP – 2
Green Chemistry and Sustainable Education

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Today, in the face of growing environmental problems for the world community, it is necessary to solve the problem of a sustainable education system, which uses an ecological approach in teaching natural sciences based on the ideas of "green chemistry".

To disseminate the ideas of green chemistry, scientific and educational centers are being created, such as "Chemistry for Sustainable Development - Green Chemistry" at Moscow State University named after M.V. Lomonosov. For many years the Institute of Chemistry and Sustainable Development has been operating at the Russian University of Chemical Technology named after D.I. Mendeleev. Educational eco-centers, chemical-ecological schools "Green Chemistry" are being developed for schoolchildren. In some schools, the theory and methodology of studying chemical industries are considered and elements of green chemistry are introduced into school chemistry experiments. A systematic axiological approach is provided as a methodological basis for the formation of the concept of "green chemistry".
However, there is clearly not enough research on the systemic formation of the concepts of "green chemistry" among students in the process of teaching chemistry students at school and preparing students - future chemistry teachers for this mission.

In this study, a theoretical analysis of works on the problem of teaching green chemistry at school, it was revealed that the majority of schoolchildren have no idea about the ideas of this concept; defined the definition of the concept of "green chemistry"; the ways of formation and development of the concept of "green chemistry" in the school chemistry course are revealed; developed and tested appropriate practical work for students in chemistry classes at the Small Chemical Institute. The assessment of chemical reactions on greenness using the green star has been introduced (the approach is proposed by the British school). The number of angles in a star is equal to the number of principles used to evaluate the synthesis reaction. The length of each corner is equal to the degree of fulfillment of the principle. The larger the area of the star, the greener the reaction.

The topics of school chemistry, which are most favorable for the formation and development of the concept of "green chemistry" in the classroom, have been identified, author's technological maps have been developed for them. It is concluded that it is advisable to jointly consider the concept of green chemistry and the topics of the school chemistry course.

SOP – 3

Universal Limno-Ecological Classification as A Tool for Modeling Water Bodies in The Ecological Frame of Green Urban Areas

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One of the most difficult theoretical issues of forming an ecological framework twin of urban areas is the methodology of the natural objects database. Water bodies are especially significant from the point of view of sustainable development of territories. Limnosystems determine the sustainability of natural biodiversity of urban flora and fauna. Limnosystems dampen the technogenic negative impact on the environment, serve as a recreational area. At the same time, occupying a fairly large area, limnosystems are among the first to be exposed to anthropogenic impact and degrade under the influence of negative external factors. In such conditions, it is especially important to conduct continuous monitoring of the state of limnosystems with automated monitoring of the dynamics of the state of key classification signs and external factors. The successful solution of this problem is directly determined by the classification method, the range of controlled parameters and their details. Currently, there are a large number of classifications in which the prescribed characteristics of water bodies are laid[1]. Among them one can find qualitative, genetic (by origin), morphometric, thermal, hydrological, hydrochemical, hydrobiological, etc. Such limnological classifications, which assess the lake by one parameter, can be considered as one-parameter. Multiparameter classifications are extremely rare and are essentially universal. Data processing techniques should ensure the intensive development of primary converters, computing technology and the widespread use of fuzzy logic, machine learning and artificial intelligence[2]. For this reason, the task was set to create a universal limno-ecological classification (ULEC), suitable for classifying the lakes of the world.

To create a universal limno-ecological classification (ULEC), the classical criteria have undergone significant revision and have been supplemented by a geographic zone, altitude, water mixing mode, hydrogen index, and a number of other criteria. ULEC for lakes on a global scale generally takes into account 7 parameters and 15 features. With a view to further machine processing, the criteria coding method was revised: to designate a feature, the first letter of its name in the corresponding version is used. Each feature includes from 4 to 18 indicators. Each parameter has its own rationale, which is an application of the classification with an indication of the literary source. As a result, the structure of the classification has the following form: 7 parameters, 15 features, 84 indicators, a total of 8820 differentiated states. The universal limnological classification takes into account all the main components of lakes, the type of lake in the form of a single formula and can be used on a global scale. The possibilities of using ULEC for the typification of lakes are shown on the example of the lakes of the Middle Volga region, Russia, and the world lakes from different continents.

Nizhny Kaban lake (Kazan, Russia) - Z_3 H_2 $G_{5\text{-}6}$ A_4 D_3 W_4 T_3 Mix_1 Tw_5 M_4 $I_{2(1)}$ Ph_3 Tr_5 Fl_3 Fa_3 - zonally moderate, old-karst, small (56 hectares), medium-deep (up to 16 m), drainless, warm-water, dimictic, with very low water transparency, oligohaline, sulphate-calcium, with alkalizing waters, hypertrophic (presence of hydrogen sulphide at the bottom), macrophytic with low species diversity (20 macrophyte species, 150 phytoplankton species), fish (8 fish species, 71 zooplankton species), with background fish species.

Baikal lake (Russia) - Z_3 H_3 G_1 A_1 D_1 W_1 T_2 Mix_1 Tw_1 M_2 $I_{1(1)}$ Ph_1 Tr_1 Fl_2 Fa_1 - zonally moderate, tectonic, very large (31500 km^2), with very great depth (1637 m), flowing, moderate in temperature regime, dimictic, with very high transparency of waters, low-mineralized, hydrocarbonate-calcium, with normal, neutral waters according to the reaction of the environment, ultraoligotrophic, macrophytic with a rich species diversity (133 species of endemic plants), fish (52 species of fish) with rare species of fish.

Lake Beysehir (Turkey) – Z_2 H_4 G_1 A_2 D_4 W_2 T_4 $Mix_?$ Tw_3 $M_?$ $I_?$ $Ph_?$ $Tr_?$ Fl_2 $Fa_?$ – zonal subtropical, tectonic, large (656 km2), shallow (10 m), inflow, very warm in temperature, with medium transparency of waters, macrophytic with rich species diversity, fish (12 species of fish).

The main difference between the universal limno-ecological classification (ULEC) is multicriteria, high discreteness and the combination of all signs of the classification of lakes in the form of a single formula, which allows the use of machine data processing methods for large-scale typification of lakes in different regions of the world. ULEC can be used for large-scale zoning of large territories, for comparative analysis of measurements taking place with lakes, for monitoring, statistical and mathematical data processing, and development of programs for sustainable development of urban areas.

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SOP – 4

Adsorption Mechanism of Organic and Inorganic Pollutants from Aqueous Solutions on the Corncob Activated Carbon

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Activated carbon is a unique adsorbent capable of adsorbing various types of pollutants from the aqueous and gas phases with very high performance. This ability of activated carbon is due to its high surface area and large functional groups. The mechanisms by which activated carbon adsorbs these pollutant species have always been a matter of debate. Possible mechanisms are discussed in this study.

In this study, a new activated carbon was produced from corncob by chemical activation using boric acid and after it was characterized by various parameters, its ability to remove methylene blue molecules (MB) representing organic pollutants and cadmium ions (Cd(II)) representing inorganic pollutants from aqueous solution was tested. In addition, the adsorption mechanisms of these pollutants on activated carbon were tried to be explained with equilibrium, kinetic and thermodynamic parameters.

As a result of the studies, it was determined that the pH of the solution was quite effective on the adsorption of Cd(II) ions but did not make a significant difference on the adsorption of MB. It was concluded that the mechanism for Cd(II) is mostly electrostatic, and many mechanisms are effective, especially strong π–π interactions between the carbon skeleton and MB. These mechanisms include electrostatic interactions as well as non-electrostatic partial hydrogen bonds.

While Cd(II) ions adsorbed on activated carbon could be desorbed quantitatively even with dilute acid solution (0.25M HCl), none of the selected elution solution could quantitatively desorb the adsorbed MB molecules. In addition, from the thermodynamic data, the adsorption enthalpy for Cd(II) was 6.51 kj/mol, while it was 22.15 kj/mol for MB. In the light of these results, it can be said that the adsorption mechanism of Cd(II) ions on the activated carbon occurs more physically (electrostatic interactions, physisorption), whereas MB molecules occur more in a chemical way. Because an enthalpy value higher than 20 kJ/mol mostly indicates chemisorption.

PP – 1

Quantitative Analysis of Various Sterols in The Structure of *Hibiscus sabdariffa* Plant by GC-MS Method

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Sterols are abundant natural organic substances in the structure of plants. There are more than 200 different types. But three types are more common in plants. Sitosterol, campesterol and stigma are sterols. Although sterols are unsaturated molecules containing double bonds, saturated types that do not contain double bonds are called stanols. They are substances that reduce unhealthy total cholesterol and LDL levels, which cause narrowing of the heart vessels. They are also used as cholesterol-lowering additives in foods. In addition, it has protective effects against cancer, ulcers, inflammation, and fungal activity.

In this study, we aimed to isolate such healthy, useful, non-toxic substances from the widely used Roselle (*Hibiscus sabdariffa)* plant and to perform GC-MS analysis. For this purpose, 2 g of dry powder Hibiscus plant was subjected to ultrasonic extraction for 5 hours in acidic-methanol solution and GC-MS analysis was performed after derivatization. When it is determined that the plant contains 20% Stigmast 5-en-3-ol, 27% (23S) -ethylcholest-5-en-3-ol, 10% other stigma derivative sterols, separating the purer substance with TLC method and again GC -MS analysis can do. There are studies about HPLC analyzes of sterols in plants, but since there is no study to use the GC-MS method in the analysis of phytochemicals such as sterols from this plant, this aspect constitutes the original value of our study. This study will be applied to waste of plants, except *Hibiscus sabdariffa* in the future, which are particularly abundant and cheaply procured. Studies will be conducted to determine the biological activity properties of the sterols to be obtained and to use them as drugs.

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PP – 2

Recovery Study of Linear Alkyl Benzene Sulfonate by using Activated Carbon from LABS Waste

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LABS is a highly used anionic surfactant in cleaning products. With the increase of waste, which is one of the factors brought by the developments in the industry and increasing population density, chemical wastes are also increasing. For these reasons, the follow-up-determination and purification of the LABS component increase its importance. In this study HPLC-DAD and UV-Vis devices were used for determination of LABS.

Preconcentration was performed using activated carbon for LABS recovery and optimum conditions were determined by evaluating the results obtained with UV-vis and HPLC. Recovery from 90% in UV to more than 95% in HPLC was achieved. LOD and LOQ values were found to be 0.14 ppm and 0.48 ppm, respectively, and the %RSD value was less than 10.

As a result, an adsorption study was carried out for the recovery of the LABS component produced in the factories and seen as waste, and the waste LABS was recovered as a product. Successful results were obtained in the recovery with activated carbon.

PP – 3

Adsorption Properties of the Rutile Phase Nano-TiO_2

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The use of TiO_2 as an adsorbent with photo catalytic properties provides many advantages: TiO_2 is chemically and thermally stable than TiO_2 which has a photo catalytic effect is widely used for purification from toxic substances.[1] From this point of view so far, we have considered many similar processes.[2]

At first, we used TiO_2 nanoparticles (10–30nm) with a rutile phase for the adsorption of phenol from an aqueous system. Later the process of adsorption of 1 mg L^{-1} phenol solution in the presence of rutile TiO_2 nanoparticles was studied. The adsorption process took 2 hours at 25° C temperature. It was found that the adsorption of phenol in the presence of the rutile TiO_2 phase is incomplete. Although the rutile TiO_2 phase is a very good photo catalyst it has been shown to be a weak adsorbent. The nano crystalline rutile phase TiO_2 nanoparticles were characterized by X-ray powder diffraction (XRD). On the device "Varian Cary 50" the course of adsorption was studied. It was determined that the adsorption of phenol was incomplete (Fig. 1).

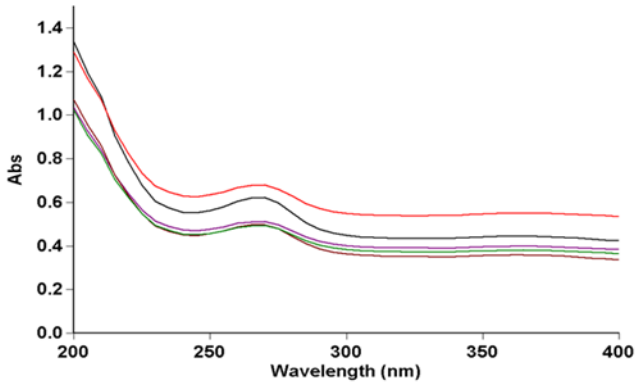

Fig. 1. Comparison of adsorption curves of phenol in the presence of TiO_2 (for 30, 60, 90, 120 minutes)

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PP – 4

Ecological Assessment of the Caspian Sea

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Nowadays pollution of aquatic ecosystems is one of the main global environmental problems. In addition, the chemical composition of sea water is an important condition for flora and fauna.[1] The Caspian Sea borders with 5 countries and for this reason, monitoring is carried out frequently and the necessary measures are taken. From this point of view, we took samples from different parts of the Caspian Sea in Azerbaijan, analyzed them, and studied their suitability as seawater. Water samples were taken and analyzed from 7 different regions of the Caspian Sea in which we analyzed mainly toxic organic compounds -phenol and its derivatives. It should be noted that chlorinated phenol derivatives in the aquatic ecosystem are 150–200 times more toxic than phenol itself.[2] The analyzes were carried out using extremely sensitive devices a GC-MSD gas chromatograph 6890N with a highly efficient mass-selective detector-Agilent 5975.It has been established that the investigated toxic organic compounds in the waste waters of the oil industry and the waters of the Caspian Sea coast exceed the permissible norm.

Table 1. Phenol and its derivatives in seven water samples taken from the Caspian Sea

Phenol, mg/l	Sahil	Shikov	Boulevard	Guneshli	28 may	Hovsan	Bilgah
phenol	0.14	0.10	0.14	0.12	0.13	0.16	0.08
o-cresol	0.06	0.02	0.03	0.02	0.04	0.45	0.01
2-nitrophenol	0.16	<0.04	0.04	0.04	0.10	0.12	0.02
2,4-dichlorophenol	<0.02	<0.02	<0.02	<0.02	0.03	0.04	0.04
2,6-dichlorphenol	0.11	0.02	0.04	0.12	0.07	0.08	0.06
4-chloro-3-methylphenol	0.21	<0.04	0.05	0.05	0.14	0.06	0.04
2,4,5-TCP	0.09	<0.04	0.04	0.08	0.07	0.10	0.06
2,4,6-TCP	0.10	<0.04	<0.04	0.09	0.07	0.10	0.06
2,3,4,6-tetrachlorophenol	0.09	<0.04	<0.04	0.08	0.10	0.09	0.07
pentachlorphenol	0.14	<0.04	<0.04	0.12	0.12	0.16	0.04

As can be seen from the Table 1, more phenol was found in water samples taken from the Sahil, Boulevar and Hovsan.

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PP – 5

An Ultrasound Assisted Deep Eutectic Solvent Based Liquid Phase Microextraction of Amaranth from Water and Food Samples

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In recent years, the use of liquid phase microextraction techniques for the determination of trace samples has gained popularity due to the use of small amounts of solvent, the short time the experiments can be performed and the ease of use. The use of deep eutectic solvents (DES) together with the liquid phase microextraction method is also very common. DES's are next-generation solvents created by combining a hydrogen bond acceptor and a hydrogen bond donor.[1,2]

In this study, a deep eutectic solvent based liquid phase microextraction method with UV-Vis spectrophotometer has been developed for the separation and preconcentration of Amaranth (E132) food dye. Deep eutectic solvent used in this method consists of tetrabutylammonium bromide and decanoic acid. Amaranth (E123) concentration was measured in a micro-cuvette UV-Vis spectrophotometer settled at 520 nm. Quantitative recovery values were obtained at pH 5.0. The limit of detection, limit of quantification and preconcentration factor were calculated as 23.0 µg/L, 76.0 µg/L and 33.3 µg/L, respectively. The developed method has been validated with environmental samples by addition-recovery studies.

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PP – 6

Development of a New QCM-Based Aptasensor for Rapid Detection of *Listeria monocytogenes*

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Nowadays the rapid detection of pathogen microorganisms is a major goal of biosensing technology applied to food safety. In fact, the ISO standardized culture method for the detection of pathogens takes up to ten days to provide a reliable response. Therefore, it is necessary to develop a novel technology that will be low-cost, fast, simple, and accurate enough. Quartz crystal microbalance in combination with nucleic acid aptamers offers such opportunities for the construction of microbial biosensing platforms. Listeriosis is a serious clinical complication caused by the bacterium *Listeria monocytogenes* infection, usually resulting from consuming contaminated food products by thşis bacterium. To prevent Listeriosis, continuous and fast monitoring of contamination in the chain of the food supply is the only viable solution. Acoustic biosensors are one of the most used sensors, as they provide real-time monitoring of affinity interactions at surfaces. QCM (quartz crystal microbalance) in combination with nucleic acid aptamers as receptors is an effective option for quantification of cell count as it has high specificity and a low limit of detection (LOD).

In this study, a simple protocol for detecting target bacteria from an aqueous solution based on a Quartz-Crystal Microbalance (QCM), and a specific aptamer has been developed. In this system, a limit of detection (LOD) less than 10 CFU/mL bacterium with a pre-enrichment step lasting only at 25 °C for 30 min has been developed. For this purpose, aptamer sequences that can bind specifically to L. monocytogenes were selected by the SELEX method and integrated into the QCM platform to create a biosensor system. Synthesized magnetic nanoparticle surface was modified for the pre-concentration system. Following pre-enrichment of target bacteria with the magnetic particles, the eluent was injected into the QCM flow cell for real-time determination of *L. monocytogenes* to the prepared QCM sensor. The sensor was reused more than 10 times without detectable loss in activity and showed negligible response to other bacteria than specific pathogen, *Listeria monocytogenes.*

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PP – 7

Ionic Liquid Impregnated Sepabeads SP70 Resin for the Separation–Preconcentration of Lead(II) in Real Samples

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Lead, a toxic heavy metal, and non-biodegradable is widely used in many industries such as transportation, agriculture, mining, ceramic products, pipe soldering, dye, and batteries. It is known that this heavy metal, which causes damage especially in the nervous system, liver, reproductive system, and kidneys, causes cancer, anemia, kidney disease, mental retardation and to behavior change, interferes with calcium and vitamin D metabolism and affects the formation of hemoglobin.[1–3]

In this study, a solid phase microextraction (SPME) method was developed in which used as an adsorbent Sepabeads SP70 resin prepared by absorbing 1-Butyl-3-methyl imidazolium hexafluorophosphate ionic liquid for the separation, enrichment, and quantitative analysis of Pb(II) ions from different environments. The adsorbent was characterized using FT-IR and SEM methods. Analytical parameters such as pH, amount of adsorbent, type and volume of eluent, sample volume and matrix effects affecting the presented SPME method have been optimized. Pb(II) ions were determined by FAAS using the microinjection method. The developed method has been successfully applied to various environmental samples and certified reference materials.

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PP – 8

Trace Determination of Sudan III in Food Samples After Supramolecular Solvent Based Microextraction

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In recent years, supramolecular solvent-based liquid phase microextraction methods for trace organic and inorganic species have gained popularity. Supramolecular solvents consist of a mixture of long chain alcohols or carboxylic acids with tetrahydrofuran and water. In this case, it provides the formation of micelles that do not dissolve in the water phase.[1,2]

In this study, a method was developed for the separation-preconcentration and determination of trace level Sudan III dyestuff from food samples. Supramolecular solvent system was formed from 1-decanol, and tetrahydrofuran and Sudan III dyestuff was extracted into the supramolecular solvent phase at pH 5.0. Measurements were made in a UV-Vis spectrophotometer with a micro quartz cuvette. The developed method has been validated by addition recovery studies on some food samples.

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PP – 9

Development of an Efficient Method of Polymer Waste Recycling

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Consumption of plastics is doubled every ten years. Among numerous polymers used by modern producers a special place belongs to polyethylene terephthalate (PET) which appeared in 1978 and conquered 100% of the world market of bottle tare from 0.33 to 5 liters utilized for packing soft drinks, beer, oil, juice and so on[1]. Each year world population produces an enormous mountain of waste – about 400 million tons. It consists mostly of polymeric and plastic waste. Large part of polyethylene terephthalate (PET), polyethylene (PE) and other polymers waste is either buried into the ground or incinerated, which is unreasonable from financial point of view, and even harmful in terms of ecology. The issues with recycling of PET bottles and PE plastic bags are remaining unsolved due to lack of original and non-expensive technologies of reprocessing. As a solution for the problem, we have developed a technology of different kind plastic waste recycling by means of joint hydrocracking with mazout in presence of catalyst, resulting in motor fuels production.

Experiments on hydrocracking have been conducted in the rotating autoclave without catalyst and with suspended catalyst (10–15 µm). In all experimental runs there have been used mazout and as plastic additives PET and PE. As an additive to catalyst (Ni+Mo-salt) and Ni on Kieselguhr have been taken. The process is carried out at operative temperature 420-440 °C, pressure 5-7 MPa during 20-30 min. After discharging the product out of the reactor liquid products are separated from the worked-off catalyst, treated with 5-10 % NaOH solution, and afterwards subjected to rectification obtaining target products – gasoline fraction of boiling temperature up to 200 °C, diesel fraction of boiling temperature 200–360 °C and residue of boiling temperature higher than 360 °C. The yield of liquid products is 90-95 % wt from the blended feedstock. For a complete conversion the unreacted residue, boiling out at temperatures >360 °C, with concentrated and partially coked catalytic additive was returned to the reactor as recycle. The composition of gasoline fractions has been analyzed by chromatographical way on the apparatus «AutoSystem» of the Perkin-Elmer firm.

After hydrocracking of mazout with PE, gasoline fraction of octane number of 60–67 points (according to the motor method), contains 0–0.3% of benzene, and acts as a high-quality raw material for reforming. Cetane number of diesel fraction is about 53.3-54 points. As a result of hydrocracking, PE and PET are depolymerized into simpler non-toxic compounds, and their mixture is further processed in presence of catalyst, together with fuel oil products, resulting in fuel fractions output. Light fractions yield at fuel oil hydrocracking with addition of polymers reaches about 90%, as compared with 70% yield without polymers under the same conditions.

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PP – 10

Treatment of Diesel and Mineral Oil Fractions from Aromatic Hydrocarbons by Extraction Method

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One of the main technological methods for separation of mixtures, purification of various petroleum fractions to produce high-quality fuels and lubricating oils that meet by operational properties what corresponds to relevant requirements of standards, is the selective purification of petroleum fractions with selective solvents such as phenol, N-methylpyrrolidone, N-formylmorpholine etc. or their mixtures which use on an industrial scale.[1]

In order a wide range of research on an industrial scale are recently conducted in the sphere of applying of solvents of ion-liquid content besides n-methyl pyrrolidone as a solvent extractant and the creating of ecologically clean “green” chemistry. From this point of view the use of solvents of high selectivity, being liquid in a wide temperature range, environmentally safe ion-liquid type as an extractant is actual in treatment of oil fractions and is very important in terms of industry.

By taking into consideration that the diesel fraction (DF) with a boiling temperature of 190–350°C separated from the mixture of Azerbaijan oils and T–46 mineral oil fraction is purified from aromatic hydrocarbons and sulfur compounds content by extraction method.

As an extractant has been used the n-methyl pyrrolidone (NMP) and its ion-liquid typed solvent containing morpholineformiate (NFM). Extraction process with NMP is realized in 3 stages. Defined that the amount of aromatic hydrocarbons in the content of diesel fraction decreases from 16% nearly to 1–2% by taking NMP:df=3:1. But the amount of aromatic hydrocarbons in the content of T–46 mineral oil fraction decreases from 16% nearly to 3–4% by taking NMP:T-46 =4:1.

Additionally, the fractions have been extracted with help of morpholineformiate extractant. Determined that the maximum treatment of diesel and oil fractions from aromatic hydrocarbons and sulfur compounds is provided when morpholineformiate used as extractant. The amount of sulfur in fractions content has decreased from 0,09–1,2% to 0,03–0,4% during the extraction process.

Thus, the cycle of studies carried out has shown the promise of using ionic liquids based on formic acid and morpholine or N-methylpyrrolidone as a selective solvent in the processes of selective purification of oil fractions and allows us to talk about the possibility of developing an environmentally more favorable and efficient technology for the selective purification of oil fractions.

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PP – 11

Switchable-Hydrophilicity Solvent Liquid-Liquid Microextraction Prior to the Spectrophotometric Determination of Sudan I Dye in Spices

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Sudan dyes, a class of azo dyes, are used in a variety of industrial and scientific applications. Even though their use as food dyes is prohibited in most countries due to their carcinogenicity, they have been found in a variety of food product.[1,2]

In this study, UV/Vis spectrophotometry was used in conjunction with switchable-hydrophilicity solvent liquid–liquid microextraction (SHS-LLME) for the extraction and determination of Sudan I dye in different spices. Optimum SHS-LLME efficiency was achieved using 600 µL of octylamine/7.5 mol L^{-1} HNO_3 (1:1, v/v) as the extraction solvent, 600 µL of sodium hydroxide as the phase separation trigger and 20 mL of the sample solution. Limits of detection were found within the range of 9.0–25.0 µg L^{-1}. Coefficients of determination (R^2) of the calibration graphs higher than 0.9977 and relative standard deviations lower than 4.5% were obtained. The proposed SHS-LLME-UV/Vis method was applied to different spices and percentage relative recoveries were found within the range of 88.7–110.1%.

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PP – 12

Activated Carbon Cloth@$NiCo_2O_4$@Fe_3O_4 as an Adsorbent for Magnetic Solid Phase Extraction of Atrazine Prior to HPLC-DAD Detection

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Because of the increase in the demand for food with the increase in population, the use of pesticides in agricultural areas is increasing.[1] Therefore, the determination of pesticides that are harmful to human health and the ecosystem remains up-to-date.

In this study, a simple, environmentally friendly, effective, and selective magnetic solid phase extraction method (MSPE) was developed for the extraction of atrazine, which is used as an herbicide to increase crop yields worldwide, from water and spices prior to liquid chromatographic (LC) analysis. For the detection and enrichment of atrazine by MSPE, synthesized hybrid nanocomposite (Activated carbon cloth@$NiCo_2O_4$@Fe_3O_4) Fourier transform infrared (FT-IR) spectra, Vibrating Sample Magnetometry (VSM), X-ray diffraction (XRD) spectrometry, Brunauer–Emmett–Teller (BET) surface area and it was characterized by scanning electron microscopy (SEM) techniques and it was observed that all components hybridized with physical and chemical bonds. Developed MSPE-LC method pH, adsorbent amount, adsorption time, eluent type and volume, interferences parameters were optimized, and extraction efficiency was determined under optimum conditions.

Activated carbon cloth@$NiCo_2O_4$@Fe_3O_4 with high adsorption capacity hybrid nanocomposite was analyzed by applying the adsorption-desorption cycle, where it can be reused at least 25 times in the determination of atrazine. Sample preparation and separation-enrichment steps are completed in just 15 minutes. The enrichment factor (PF) of the method is 20. Analysis of trace levels of atrazine was determined by the HPLC-DAD method, which has limit of detection (LOD) and limit of quantification (LOQ), 0.35 ng mL^{-1} and 1.17 ng mL^{-1}, respectively. Sample applications performed by HPLC-MSPE method were verified with liquid chromatography quadrupole time-of-flight mass spectrometry (LC-Q-TOF/MS).

As a result, the proposed method can be applied to water samples, spices, and other pesticides in the triazine group.

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PP – 13

Elaboration and Characterization of MnO_2-Nanosheets Nanomaterial: Application for Removal of Pb(II) and Cd(II)

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Heavy metals are discharged into water from various industries. They can be toxic or carcinogenic in nature and can cause severe problems for humans and aquatic ecosystems. Thus, the removal of heavy metals from wastewater is a serious problem.[1]

Various treatment technologies employed for the removal of heavy metals include chemical precipitation, ion exchange, chemical oxidation, reduction, reverse osmosis, ultrafiltration and electrodialysis. The adsorption method has proven the most effective because of its simplicity, ease of operation, and high efficiency over a wide range of concentrations. Typical adsorbents for heavy metals include perlite, hydroxyapatites, peat, carbon nanotubes, activated carbon, alumina, and clay. However, these adsorbents have several disadvantages, such as low adsorption capacity, low selectivity, and a long-time equilibrium. In this study, we investigated the adsorption behavior of Pb(II) and Cd(II) by MnO_2 nanosheets (MnO_2-NS) in an aqueous medium. The synthesis of (MnO_2-NS) is based on the exfoliation of an intermediate material lamellar leading to the formation of the nanosheets-MnO_2 material with negative charges on its outer surface, which causes a strong attraction of positively charged pollutants like metal cations.[2] The nanomaterial has been characterized by different spectroscopic techniques (XRD, SEM, etc). The study of interaction in an aqueous medium between the MnO_2 nanosheets and the metal cations Pb(II) and Cd(II) showed that the materials are highly reactive towards the metal cations.

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PP – 14

Cloud–Point Microextraction Combined with Flame–Atomic Absorption Spectrometry for the Determination of Zineb in Environmental Samples

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Zinc(II) ethylenebisdithiocarbamate (Zineb) is commonly used in agriculture and horticulture to prevent, kill, or repel a wide range of pests, as well as a plant regulator, desiccant, defoliant, synergist, and nitrogen stabilizer.[1] Because of its increased use in agriculture, this compound has the potential to enter the food chain, posing a serious threat to public health. The complexity of food matrices and presence of Zineb at ultra-trace level in environmental samples necessitate the development of effective sample preparation methods for sample cleanup and analyte preconcentration.

In this study, cloud-point microextraction (CPME)[2] was combined with flame-atomic absorption spectrometry (FAAS) for the extraction and determination of Zineb. Optimum CPME conditions were achieved with 150 µL of 1-(2-thiazolylazo)-2-naphthol (TAN) as the chelating agent for zinc, 250 µL of Triton X-114, and 20 mL of the sample solution at pH 7.0. Limits of detection were found within the range of 14.0-29.0 µg L^{-1}. Coefficients of determination (R^2) of the calibration graphs were higher than 0.9954 and relative standard deviations were below 9.2%. The proposed CPME-FAAS method was applied to some environmental and food samples with percentage relative recoveries ranging between 94.4 and 113.2%.

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PP – 15

Synthesis and Characterization of GO@ MoS_2@$ZnCo_2O_4$ Nanocomposite as an Effective Adsorbent for Solid-Phase Microextraction of Pb(II) Prior to Determination by FAAS

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In this study, GO@MoS_2@$ZnCo_2O_4$ nanocomposite structure was synthesized. In addition, the green and selective sorbent, MoS_2@$ZnCo_2O_4$ composite structure of graphene oxide were prepared using the hydrothermal method. The synthesized nanocomposite was characterized in detail by scanning electron microscope, X-ray diffraction spectrometry, Fourier transform infrared spectrometer BET instrument and determined to have adsorption capacity and high surface area. The synthesized composite material was used as a solid-phase extraction adsorbent to develop a fast and sensitive method for the extraction and preconcentration of Pb(II) and then before atomic absorption spectrometry determination. Various extraction parameters affecting the Pb(II) microextraction process were optimized, including the pH of the solution, the type and volume of desorption solvent, the sample solution volume, and the amount of sorbent. In the developed method, a method with high reproducibility at pH 5 was developed by using only 20 mg adsorbent, and quantitative (>95%) extraction of trace Pb(II) ions was performed. The accuracy of the method was examined using certified reference materials. Ultimately, the developed method has been successfully applied for the extraction of Pb(II) from various samples with acceptable recoveries.

PP – 16

Workflow: Microplastic Analysis in the Water, Sediment and Biota in the Marine Environment

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Microplastics (MPs) are defined as plastic pieces below 5 mm. They have their origin in cosmetics, cleanser products and fibres (primary MPs) and in the fragmentation and erosion of plastics pieces and debris (secondary MPs). Researchers have found microplastics in marine and terrestrial life. It invades the food chain, and it's even been found in salt, sugar, beer, alcohol, honey, glaciers, and rainwater.[1]

Microplastics can be toxic depending on their composition. It can also act as a carrier of other molecules that attach to it. Due to environmental contamination and analytical difficulties, it is necessary to be very sensitive from the sampling to analysis steps. A typical analysis workflow for microplastic separation, counting, and identification via spectroscopic techniques requires five delicate key steps. Sampling, sample preparation or sample pretreatment, filtration, measurement and finally analysis/reporting.[2]

Most of the methodologies are based on the separation particles of fibers or MPs followed by counting methods, in most cases by manual procedures and visual inspection. It is a commonly used flotation/separation process for water and sediment. Then, MPs are separated manually when it is possible, or by means of filtration. MPs are extracted from the material by wet digestion of organic matter with H_2O_2, alkaline or acidic attack, and/or enzymatic digestion (specially for biota). Afterwards, another density flotation separation is necessary before the identification.[1–3] In most of the works, identification of the MPs is based on visual identification. Chemical characterization of the polymer types can made with Fourier Transform infrared spectroscopy (μ-)FTIR and (μ-)Raman microscopy, selected scanning microscopy (SEM), and pyrolysis and/or thermal desorption gas chromatography coupled to mass spectrometry (Py-GC-MS and TD- GC-MS, respectively).[1,2]

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PP – 17

Macro- and Microcomponent Composition of Kuialnyk Estuary Peloid

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Kuialnyk Estuary is a natural estuary of the Black Sea with a unique mineral composition of curative peloid. The macro- and microelement composition of peloid plays an important role in the manifestation of its therapeutic effect. At the current study, the main ions involved into the implementation of anti-inflammatory and antispasmodic effect of the Estuary peloid were selected. Thus, magnesium has an antispasmodic effect, relaxing smooth muscles, lowers the excitability of the central nervous system and is a calcium antagonist. Calcium causes vasoconstriction as well as an increase in vascular resistance and in small doses is a desensitizer. Chloride ions contribute to the development of hyperpolarization of nerve cells, a decrease in their excitability and conductivity. However, the presence of anthropogenic pollution can potentially make a negative contribution to the mineral composition of the peloid; therefore, the purpose of our study was to determine the macro- and microelement composition of Kuialnyk Estuary peloid.

Trace elements	Zn	Cd	Pb	Mn	Cu	Ni	Hg	Cr	Li	Sr
Content, mg/kg	23.94	0.024	0.313	57.4	9.15	7.45	0.187	0.054	0.6	0.0341
Standard	<5.0 mg/dm^3	< 0.01 mg/dm^3	<0.1 mg/dm^3	0.1–4.0 µg/kg	<1.0 mg/dm^3	40.0 mg/kg	<0.02 mg/dm^3	<0.5 mg/dm^3	1.0–5.0 mg/kg	<25.0 mg/dm^3

The study was carried out by standardized titration methods, atomic absorption, and atomic emission spectrometry. As a result, the content of the following ions in the peloid was identified: Na^++K^+ = 36,7 g/dm^3, Ca^{2+} = 2,4 g/dm^3, Mg^{2+} = 8,3 g/dm^3, Cl^- = 79,8 g/dm^3, SO_4^{2-} = 6,2 g/dm^3, HCO_3^- = 0,9 g/dm^3, CO_3^{2-} = 0,2 g/dm^3. The unique microelement composition of Kuialnyk Estuary plays a key role in the manifestation of its therapeutic effect. Therefore, the content of trace elements in samples of dry peloid has been studied. It was shown that heavy metals are in the peloid of the Kuialnyk Estuary within the limits of permissible concentrations which is not an obstacle to their use for therapeutic purposes.

PP – 18

Electrochemical Determination of Heavy Metal Ions Using Solid Contact Electrodes

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Electrochemical determination of heavy metal ions using solid contact electrodes Chemical compounds made by boron atom and dipyrromethene ligands are defined as Borondipyrromethene (BODIPY). BODIPY, is one of the high fluorescent dyes and is a unique compound widely used in many different fields.[1]

For the analysis of heavy metal ions, electrochemical analysis methods have many advantages such as high sensitivity, fast analysis, simple equipment, and portability. The improvement of detection sensitivity is also done by appropriately changing the surface of the working electrodes.[2]

In this study, electrochemical surface characterization of the electrode surface modified with a BODIPY was performed. During these studies, cyclic voltammetry, differential pulse voltammetry and square wave voltammetry techniques were used. Firstly, optimum conditions (optimal volume, optimum pH, optimum scanning rate) for surface modification with BODIPY-A were determined. Then experiments were carried out for the determination of metal ions.

It has been observed that the prepared modified electrode can be used successfully in metal tests.

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PP – 19

Restoration of a Unique Ribbon Pine Forests After the Fire

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The ribbon pine forests of the Altai Territory, covering an area of more than 1 million hectares, have no analogues in the world. Without ribbon pine forests, during strong storms, accumulated for millennia, the fertile soil layer can be destroyed in a matter of minutes, since with their powerful roots, pines hold back millions of tons of sand. Forests increase air humidity, and with it, the amount of precipitation. In winter, they hold back snow, which turns into melt water in spring, moisturizes the soil and nourishes recourses. Pine forests are also a kind of dust collector, absorbing dust and purifying the air. The Altai ribbon pine forests, growing in extreme arid climate conditions, are periodically exposed to forest fires, which cover an area of tens of thousands of hectares.

The special ecological value of ribbon pine forests makes it important to take the necessary measures to accelerate the restoration of plantings after fires.

The preservation of the belt pine forests and the restoration of individual belts, which are of great soil-protective, agronomic, and climate-regulating significance, is a matter of national importance.

The purpose of this work was to study the effects of fires on pine plantations, soil, and the use of the experience of successful reforestation processes in the 20th century and today. The paper provides an analysis of the literature on this issue, a comparison of forest restoration methods, identification of the most effective methods in order to use them in practice.

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Metal-Organic Frameworks as Sorbent for Solid Phase Extraction Coupled with Gas Chromatography Mass Spectrometry for Simultaneous Extraction and Determination of Food Contact Materials Substance from Water Samples

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The generation and utilize of food contact materials (FCMs) have been increased within the final long time. The movement of substances from FCMs to water resources are primarily household and industrial waste. FCMs can be occurrences in sea-going biological systems, counting metropolitan wastewater, surface water, ground water, and indeed within the drinking water around the word. Thus, the occurrence of FCMs in aquatic area is a potential threat to human health and ecosystems. It is basic to develop sensitive analytical methods to screen FCMs residues within the drinking water, farm and industrial wastewater[1]. Considering the trace level of FCMs existing in aquatic environment and needed preconcentration and separated from sample matrix with sample preparation techniques include liquid-liquid extraction (LLE), solid-phase extraction (SPE), and solid-phase micro extraction (SPME). In this study, MOF-5 from Metal-organic frameworks (MOFs) is used as SPE material.

MOFs are a new class of multifunctional microporous materials constructed with metal ions and organic ligands via coordinate bonds. MOF-5 was successfully fabricated to literature[2] and applied as an effective sorbent for preconcentration of the Di(2-ethylhexyl)phthalate (DEHP) as FCMs substance from water samples. DEHP was quantified in the water sample with GC-MS. The relative recovery of the DEHP was obtained upper the 90.0%. The experimental procedure was given blow figure 1.

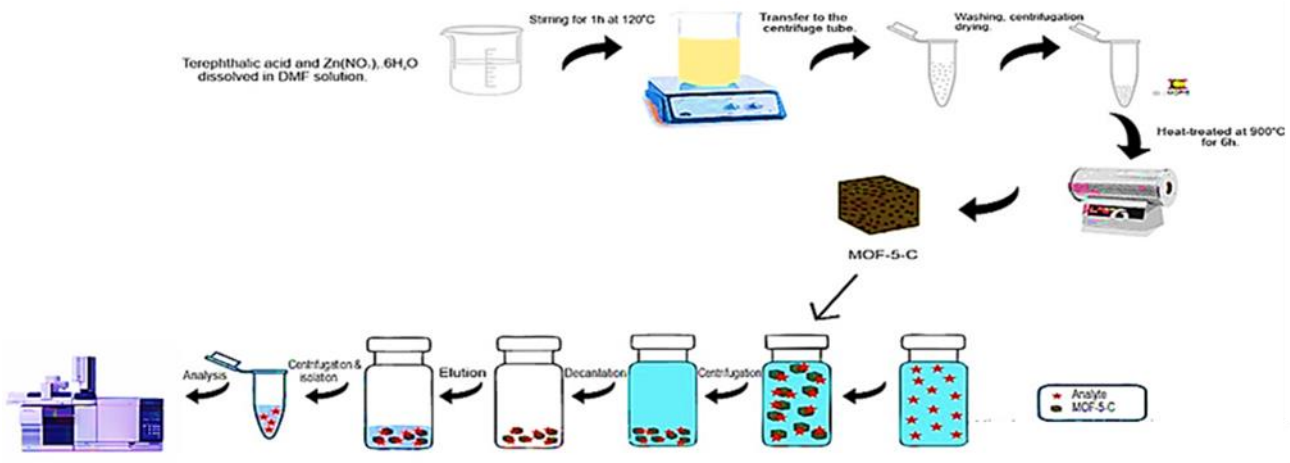

Fig. 1. Schematic overview of the experimental procedures.

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PP – 21

Determination of Mercury Using Magnetic Nanoparticles

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Mercury is one of the most toxic elements that can be found in natural water bodies. In environmental and biological systems, mercury exists in three oxidation states. In general, inorganic Hg(II) ions predominate in water, soil, and sediment, while methyl mercury (MeHg(I)) predominates in biota. In the atmosphere Hg(0) is the primary type.[1,2] Water is the main transport and transformation route of mercury to the environment and living organisms. Therefore, mercury analysis in water is of great importance for monitoring water quality and its associated environmental impacts.[3]

In this study, a magnetic solid phase extraction (MSPE) method was developed using Fe_3O_4 nanoparticles (Fe_3O_4@Ppy) coated with polypyrrole for the preconcentration of trace level of Hg(II) ion. Polypyrrole coating on Fe_3O_4 was experimentally modified. The surface properties and possible binding sites of the prepared magnetic nanoparticle were evaluated using Fourier Transform Infrared Spectroscopy-Attenuated Total Reflection (FTIR-ATR), X-Ray Diffractometry (XRD) and Scanning Electron Microscopy (SEM). Analyte adsorbed at pH 5 with 100 mg Fe_3O_4@Ppy were desorbed with 3 mol L^{-1} HNO_3. Mercury in the eluates was determined by flow injection cold vapor generation atomic absorption spectrometry (FI-CVG-AAS). The device parameters were optimized as the atomizer temperature was 120 °C, the carrier solution was in 3% (v/v) HCl, the reducing agent was in 0.2% (w/v) $NaBH_4$, 0.05% (w/v) NaOH.

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PP – 22

Investigation of the Activity of Sodium 4-(((4-Hydroxyphenyl) Imino) Methyl) Benzene-1,3-Disulfonate on Some Plant Pathogen Bacteria

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Pesticides are used in the fight against various pests in order to increase the product yield in Turkey and in the world. Although modern application techniques try to deliver these substances only to target organisms, pesticides sometimes go off-target due to drift and residual effects in the soil. Apart from that, they tend to spread in the environment due to some physical events such as surface flow. Whether pesticides are carried out of the target or not, living things in the agroecosystem and in ecosystems close to these systems are affected by these chemicals. In addition to the studies that will increase the effectiveness of the active substances used in the field of plant protection on the target organisms, researches on the production and use of more harmless plant protection drugs in terms of health and ecological balance have also gained importance.[1]

In this study, firstly, In order to determine the fluorescence properties (excitation and emission wavelengths, fluorescence intensities) of the solutions of the newly synthesized Schiff base (sodium 4-(((4-hydroxyphenyl)imino)methyl)benzene-1,3-disulfonate) prepared in distilled water at different concentrations, the emission spectra were taken by changing the excitation wavelengths at intervals of 10 nm and the excitation and emission wavelengths with the maximum fluorescence intensity were determined. After determining the optimum fluorometric parameters of the Schiff base, an optimization study was carried out to determine the most suitable parameters such as pH, Schiff base concentration, temperature, and interaction time for their interaction with DNA. In the optimum conditions determined, the interactions of Schiff base with the DNA of plant pathogenic bacteria that cause disease in crops such as tomatoes, beans, apples, and pears were investigated. While working with DNAs by applying a general procedure, Schiff base concentration was kept constant, and DNA was added at varying concentrations (0-100 micromolar). It was concluded that the compound interacts with or binds to DNA according to the decrease or increase in the fluorescence intensity of the Schiff base. The DNA binding constant or quenching constant of the compound was calculated as a result of the calculations made by taking into account the effects.

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PP – 23

Novel SPE-FI-FAAS Method for the Determination of Cu(II) Ions at Trace Levels in Waters

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The determination of the metal ions in waters at trace level generally requires sample pretreatment procedures such as separation and preconcentration methods prior to measurement step by modern instrumental techniques. In the literature various methods have been reported for the separation and preconcentration of metal ions including solvent extraction, solid phase extraction (SPE), co-precipitation etc.[1,2] On-line solid phase extraction is easy operated and highly efficient preconcentration method.[3,4]

In this work, a novel chelating resin of N-{[3-[(3-aminopropyl)amino]propyl}-2-hydroxy-benzaldimine bonded silica gel was fabricated. The obtained adsorbent was characterized by C,H,N elemental analysis and FTIR spectroscopy. The on-line SPE of Cu(II) ions was developed using a novel chelating sorbent filled column connected with flame atomic absorption spectrometer. Optimum FI-SPE conditions for Cu(II) ions were studied by analyzing the effects of parameters such as sample pH, eluent concentration and types, flow rates and volumes of sample and eluent, and matrix ions. The Cu(II) adsorption capacity of the sorbent was calculated as 24.7±0.3 mg/g. The developed method was validated by analyzing Cu ions level in two certified material of Ontario Lake water (NWTMDA-54.4) and Water-trace elements (NWTM-15.2. The developed method was successfully employed for the determination of Cu(II) ions in tap, river and seawaters.

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PP – 24

An Increasing Threat to the Environment: E-Waste

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The world population is expected to increase by 2 billion in the next 30 years, from 7.7 billion currently to 9.7 billion in 2050,[1] and 68% of the population will live in cities.[2] Due to the increasing population and rapid urbanization, the global annual waste production, which was 2.01 billion tons in 2016, is expected to increase to 3.4 billion tons in the next 30 years.[3] The increase in these e-wastes is at the level of 53.6 Mt/year (approximately 34%-in total solid waste) in total solid waste.[4] It has been reported that the vast majority of e-waste is solid waste. Electrical and electronic equipment (EEE) is defined as a gadget or piece of equipment that requires electrical currents or electromagnetic fields to perform the function for which it was designed and manufactured.[5] E-waste, which is within the scope of the European Union (EU) Waste Electrical and Electronic Equipment (WEEE) Directive, is divided into six categories according to recycling and recovery targets. These are air conditioners, refrigerators, and coolers; large white goods (excluding refrigerators, coolers, air conditioners); televisions and monitors; IT, telecommunications, and consumer equipment (excluding TV and monitors); lighting equipment; small household appliances, electrical and electronic equipment, toys, sports, and entertainment equipment, monitoring and control devices.[6] The high potential of toxic chemicals such as lead, cadmium, mercury, chromium in metal, plastic, glass, etc., components in WEEEs to harm the environment and human health makes the disposal and evaluation of these wastes crucial and priority.[7] Although the level of progress in regulations and practices varies between countries, the recovery and recycling rates of e-waste in European countries are higher than in other countries.

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PP – 25

Polyhedral Oligomeric Silsesquioxane (POSS) for Photocatalytic Removal of Environmental Waste

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Considerable attention has concentrated on the preparation of organic/inorganic hybrid materials with excellent properties using nanoscale inorganically enhanced agents such as nanoparticles, clay, fullerene, carbon nanotubes, graphene and polyhedral oligomeric silsesquioxanes (POSS). POSS is non-toxic and tasteless and has good biocompatibility, stability, and other characteristics, which is used as a "nano-building" unit for the preparation of new organic–inorganic hybrid materials. Its structural formula is $(RSiO_{1.5})_n$ ($n \geq 4$), and its nanostructures have diameters ranging from 1 to 3 nm which can be considered as the smallest possible particles of silica, i.e., molecular silica.[1,2]POSS consists of an inorganic cage framework composed of Si-O-Si and a shell covalently bonded with organic group R. The organic group R can be an inert group such as H, alkyl, aryl, etc, and also can be vinyl, hydroxyl, amino and other reactive groups.[3]

In our study, octa-*γ*–chloropropyloctasilsesquioxane (POSS-Cl_8) was synthesized by hydrolytic condensation. Characterization of synthesized POSS-Cl_8 was performed by NMR, FTIR and DTA-TGA analyses. In addition, the photocatalytic performance of POSS-Cl_8 in its bare form and when it is grafting a semi-metal structure was evaluated. As a result of the studies, it was determined that POSS-Cl_8 does not have any photocatalytic activity on bare form but increases the photocatalytic activity when it is grafting the semiconductor structure.

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PP – 26

Cloud Point Extraction of Sudan IV from Environmental Samples Prior to Its Determination by UV-Vis Spectrophotometry

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Among the azo dyestuffs classified as category 3 carcinogenic substances by the International Agency for Research on Cancer (IARC), especially Sudan dyes are food dyes that should be investigated, detected, and banned. [1,2] A separation-preconcentration procedure for Sudan IV has been developed for its cloud point extraction (CPE). Sudan IV was analyzed by UV-Vis spectrophotometer at 520 nm. The most important parameters, pH, surfactant type and amount and alcohol volume, matrix effect were optimized. Sudan IV was quantitatively recovered at pH 6 by using the water-soluble non-ionic polymer surfactant Tergitol 15-S-7 and n-pentanol with a lower carbon number rather than alcohols with longer alkyl chain lengths. In order to validate the developed new CPE method, addition-recovery studies to natural water and food samples were used. The new method was applied to determination of Sudan IV in natural water and food samples including spices and vegetables.

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PP – 27

Characterization Techniques of Marble Samples Before Protective Coating

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Especially architectural marble surfaces may be damaged by several factors: natural weathering, polluted atmosphere containing particulate matter, polluting gases such as nitrogen oxides (NO_x), volatile organic compounds, water carried salts, acids, and microorganisms. The protection of archaeological and monumental heritage is therefore a serious challenge in urban environment. Especially in the case of light-colored cladding the blackening or surface degradation can be considered visually unacceptable more easily.

Therefore, protective coating studies are very important to prevent or reduce all these deteriorations. Conservation treatments and repeated cleaning actions may alter further the aesthetic aspect of treated surfaces.[1–3] Since the mid-1990s, the ability of semi metals to oxidize and decompose organic and inorganic materials or pollutants has been used in a broad range of photocatalytic products (fabrics, purification systems, etc.) including coatings. Self-cleaning coatings can keep the surfaces of the materials cleaned by the action of sunlight. In addition to this photocatalytic effect, there is also photo-induced hydrophilicity that prevents the adhesion of these organic contaminants and dust by flattening water droplets on the surface of the materials.

In order to show the effectiveness of the coating, the characterization of marble surfaces before and after protective coating is very important and many techniques are used for this purpose. Within the scope of this study, marble samples from Adıyaman, Afyon and Balıkesir regions were prepared in different dimensions. After the samples were brought to constant weight, they were characterized by XRD, SEM-EDX, XRF, percent porosity (water absorption by volume) and percent water absorption (water absorption by weight), AFM, thermal analysis, contact angle measurement and capillary water adsorption tests.

Acknowledgement: This work is supported by the TUBITAK (The Scientific and Technological Research Council of Turkey), project number is 219M166.

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PP – 28

Synthesis of Copper and Zinc Complexes of a Schiff Base Derivatized from Phenylglycine

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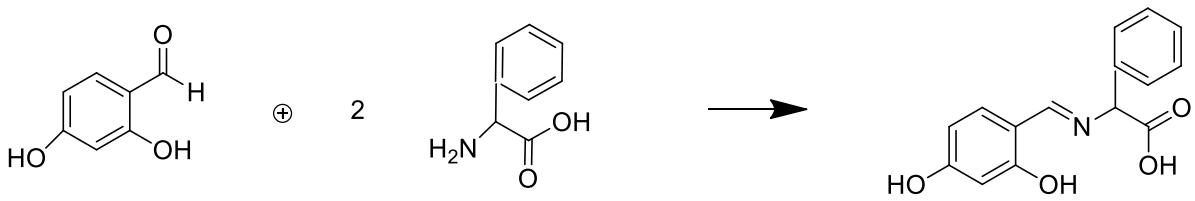
Schiff bases are versatile ligands containing imine or azomethine. Therefore, they have wide application areas. These are anticancer, antibacterial, antituberculosis, antifungal. also, some Schiff bases have fluorescence, potentiometric cation maintenance and collection properties.

Schiff bases and their metal complexes play an important role in the bioinorganic chemistry due to their structural diversity and wide spectrum of their biological activities. A number of Cu(II) and Zn(II) complexes with Schiff bases have been already studied for antibacterial,[1–2] antimycotic ,cytostatic and cytotoxic activity,[3] interaction with DNA, radical scavenging effect , and enzyme inhibition.

Metal complexes of the Schiff-base ligands containing amino acids have a variety of applications, including clinical, analytical, and industrial applications. Such complexes have been also utilized as catalysts for many reactions and as low molecular models in understanding of biological processes. In particular, transition metal complexes of salicylaldehyde amino acid Schiff bases may serve as stable models for the key intermediates in many metabolic reactions of amino acids catalysed by enzymes requiring pyridoxal as a cofactor.

In this study, we carried out a classical condensation reaction that used 2,4-dihydroxybenzaldehyde and phenylglycine to obtain Schiff bas based on amino acid. Then, the copper and zinc complexes of the Schiff base based-on phenylglycine were prepared in suitable condition such as methanolic medium, temperature etc. All compounds were characterized with FT-IR and NMR spectroscopies and melting point.



Scheme 1. The synthetic route of the Schiff base based-on phenylglycine

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PP – 29

Screening Some Enzyme-İnhibitory Activity in Ascidian *(Botryllus schlosseri)* from Trabzon, Turkey

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Ascidians or sub-phylum Tunicata could be found in all marine environments from coastal to the open sea.[1] However, all the organisms are sessile. They cannot escape from their predators and competitors. In nature, they must produce a vast complex compound with defensive properties (e.g., antipredatory, antifouling).[2] In recent years, ascidians have received more interest in the field of pharmaceutical usage because of their natural therapeutic properties.[3]

In this study, *Botryllus schlosseri* was collected from Trabzon beaches in May 2020. Some industrial enzyme inhibitory and physical properties of *Botryllus schlosseri* were studied. The results of the analyzes are found as physically (%Lipid: 28.00±0.00, %Solid matter: 5.49±0.01, %Water content: 84.51±0.01, %Protein content: 57.0±0.0, pH: 9.70±0.0) and as enzyme inhibitory (Urease IC_{50}: 4.46±0.00 mg/mL, Amylase IC_{50}: No Detection, Acetylcholinesterase IC_{50}: No Detection).

These findings show that *Botryllus schlosseri* have insufficient inhibitory effect on the enzymes we worked. We believe that apart from looking for these results, future research should look for deep investigation other properties that are important for health industrial usage.

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PP – 30

New Emerging Pollutants for the Drinking Water Supplies: Microcystins Caused by Eutrophication

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In recent years, the problem of eutrophication accelerated by human activities in water sources has been increasing rapidly. This problem poses a major threat to drinking water sources due to various emerging pollutants released by cyanobacteria, an important kind of phytoplankton. Nowadays, they are classified as emerging because of the rising level of concern in drinking water sources. These compounds are called cyanobacterial toxins, cyanotoxins, which cause mainly taste and odor problems in the drinking water. Furthermore, there are important results in the literature that these are carcinogenic and genotoxic. Since they are regarded as micropollutants, they cannot be treated by the drinking water treatment plant and easily reach human health and cause toxic effects. Therefore, cyanobacterial toxins should be treated with Advanced Oxidation Processes (AOPs) gained much attention in recent years. Among other AOPs, ultrasonic oxidation (US) has become one of the most remarkable oxidation methods in terms of both providing effective lysis of cyanobacterial cells and allowing for the efficient degradation and mineralization of cyanobacterial toxins released during cell lysis. This method also has the advantage of having on-site application and large-scale treatment options. This study reviews both the characteristic of microcystins in terms of their hazard and their advanced treatment via ultrasonic oxidation.

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The Determination of a Double Frequency Ultrasonic Reactor Efficiency via Degradation of Cyanobacterial Toxin

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The eutrophication problem is regarded as one of the most important environmental problems for freshwater environments such as lakes, ponds, and estuaries caused by domestic and agricultural activities which are the main source of some nutrients such as nitrogen and phosphorus. Eutrophication limits the beneficial use of freshwater resources and damages aquatic ecosystems via the algal toxins. The most important microalgae group that plays an important role in eutrophication is cyanobacteria and increasing concentrations of cyanobacteria and dependently their toxins (cyanobacterial toxins) in the aquatic environment cause a potential risk for human health and aquatic life. Since cyanobacterial toxins are classified as micro-pollutants, they mostly reach human health without being treated in water treatment plants and cause important health problems. For this purpose, the treatment of MC-LR selected as target cyanobacterial toxin was studied with ultrasonic oxidation (US) which is one of the most popular Advanced Oxidation Processes (AOP) in this study. Ultrasonic oxidation of MC-LR was carried out in a double frequency ultrasonic reactor consisted of both a low (20 kHz) and high-frequency ultrasonic reactor (862 kHz) and the results were analyzed by LC-MS/MS method to define the treatment efficiency. The optimum power of the ultrasonic reactor was calculated by calorimetric method.

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Optimization Studies of the Degradation of Cyanobacterial Toxin in a Custom-Made Ultrasonic Reactor

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Rapid developments in the industry, agriculture, and urbanization cause hundreds of chemical compounds to participate in human life and the ecosystem every day, and these chemicals have potential risks for the environment. As a result of this, the latest studies have proven that a wide variety of new micropollutants have emerged in water resources and that their concentrations have significantly increased. Although the concentration of micropollutants in the aquatic environment are relatively low (µg/L – ng/L) for now, these micropollutants are regarded as important that need to be monitored and controlled in terms of both the environment and human health due to their poor biodegradation capacity and bioaccumulation characteristics in living bodies and natural environments. One of the most important of these environmental pollutions is cyanobacterial toxins originating from cyanobacteria, which pose a significant threat to the aquatic ecosystem. Cyanobacteria are the smallest aquatic organisms found especially in freshwater ecosystems and have increased rapidly because of anthropogenic pollution in water resources in recent years creating the problem of eutrophication (harmful algal bloom). This problem caused by cyanobacteria in aquatic environments has hazardous effects on both human and ecosystem health worldwide. Therefore, the degradation of a cyanobacterial toxin, MC-LR, in custom-made double frequency ultrasonic reactor was investigated in this study. Ultrasonic oxidation of MC-LR was carried out in a double frequency ultrasonic reactor consisted of both a low (40 kHz) and high-frequency ultrasonic reactor (578 kHz) and the results were analyzed by LC-MS/MS method to define the treatment efficiency.

PP – 33

A Comparative Study on Ionic Liquids-Supported Metal Organic Frameworks for Solid Phase Extraction of Illicit Drugs in Water Samples

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Metal-organic frameworks (MOFs) are a new class of porous materials made from metal ions or clusters and organic ligands. Having high specific surface area, adjustable pore size, good thermal stability, and chemical resistance, as well as potential interaction forces, MOFs are considered one of the most popular and successful methods when combined with other materials. Since ionic liquids have negligible vapor pressure, non-flammability, and physicochemical properties such as good dissolving capacity, IL/MOF composite materials were used in this study before chromatographic analysis.[2] Pretreatment techniques based on IL/MOFs are a potential material for the analysis of pollutants such as illicit drugs in waters. Therefore, IL/MOF composites were synthesized by post-synthesis impregnation method using metal organic frameworks as MIL-101 (Cr) and NH_2-MIL-53 (Al) and ionic liquids as [BMIM]-[Cl] and [BMIM]-[BF_4]. X-ray Photoelectron Spectroscopy (XPS), Fourier Transform Infrared (FT-IR) spectra, X-ray Diffraction (XRD) spectrometry, Thermogravimetric Analysis (TGA), and Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray Analysis (EDX) analyses were used for the characterization of IL/MOF composites. Characterized IL/MOF composites were used in solid phase extraction before liquid chromatography quadrupole time-of-flight mass spectrometry (LC-Q-TOF/MS) analysis of illicit drugs selected as models. As a result of the study, the IL/MOF composite with the best performance that can be used in the analysis of illegal drugs selected as a model in water was determined.

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PP – 34

Solid Phase Extraction of Trace Nickel as Br-PADAP chelates on MWCNT's prior to its Flame Atomic Absorption Spectrometric Determination

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One of the important techniques used in separation-preconcentration studies is solid phase extraction. The simple explanation of this technique is to attach the analyte in aqueous solution to the adsorbent and then release it in a different medium with a suitable solvent. In this case, it provides enrichment as well as separation.[1,2]

In this study, a solid phase extraction method using multiwalled carbon nanotubes as adsorbent was developed for the separation, preconcentration and determination of trace nickel by flame atomic absorption spectrometry from environmental samples. Nickel ions was complexed with Br-PADAP. The analytical parameters, such as pH, adsorbent amount, adsorption and desorption contact times, eluent volume, model solution volume and matrix effects were optimized. The method was validated by addition recovery studies and analysis of certified references materials. The method was applied to determination of nickel contents of environmental samples.

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PP – 35

Preparation and Characterization of the Double-Layered Hydrophilic Polymer-Coated Magnetic Nanoparticles: Application of Enzyme Immobilization for a Model Organic Pollutant

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The preparation of sustainable magnetic enzymatic reaction systems is especially remarkable. Moreover, stabilization and reusability of the immobilized enzymes onto magnetic supports have been well documented in many studies.

In the present study, novel double layered hydrophilic polymers coated magnetic nanoparticles were prepared in two sequential steps; in the first step, magnetic particles were coated with polydopamine, (Fe_3O_4@PDA), via self-polymerization of dopamine under alkali conditions. Similarly, the surface of the Fe_3O_4@PDA particles was grafted spontaneously with diaminopolyethylene glycol (DAPEG) as a second polymer layer by conjugation of PDA with DAPEG without using any activating agent (Fe_3O_4@PDA@DAPEG). The magnetic Fe_3O_4@PDA@DAPEG particles were characterized using ATR-FTIR, SEM, XRD, VSM, DTA, and analytical methods.

The pendant amine groups of the Fe_3O_4@PDA@DAPEG were activated with glutaraldehyde and then used for covalent immobilization of laccase. The PDA@DAPEG units of the magnetic particles can be enhanced the biocompatibility of the supports and can provide a comfortable microenvironment for the immobilized enzyme-like in the natural environment.

The optimum pH for the free and immobilized enzyme was found to be 5.5 and 6.0, respectively. The optimal temperature for the immobilized laccase was 10 °C higher compared to the free counterpart, and the temperature profile was significantly broader than that of the free enzyme. The apparent K_m and V_{max} values for the immobilized enzyme immobilized Fe_3O_4@PDA@DAPEG particles were found to be 0.56 mM and 82.7 U/min, respectively. Thermal stability of the immobilized laccase was increased at the tested two different temperatures (i.e., 55 and 65 °C) with respect to the free enzyme, and this could be due to the stabilization of enzyme via multipoint covalent attachment on the Fe_3O_4@PDA@DAPEG particles. After 5 sequential repeated runs, the remaining immobilized laccase activity was found as 83%. Finally, the operational stability of the immobilized enzyme in the dye decolorization of Acid Blue GRL as a model dye was also evaluated.

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Polyamine Decorated Algal Biomass Material for Cr (VI) Removal: A Comprehensive Adsorption and Mechanism Study

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Biosorption that utilizes biological techniques is a comparatively efficient application for eradicating trace concentrations of toxic or carcinogenic elements from contaminated water. Algal biomasses have been well recognized as biosorbents for the removal of heavy metals directly or indirectly. The utilization of non-living microalgae biomass for the adsorptive removal of pollutants is still in its early stages. Algal biomass can be feasible alternatives instead of activated carbon for wastewater treatment. Algal biomass could be one of the most promising biosorbent due to their availability, low costs, large specific surface area and their chemical and mechanical stability[1,2].

In the present work, the green freshwater alga “Spirogyra sp” was isolated from Stream Ankara and then cultivated in growth media at pH 7.5. After cultivation, the cells were harvested by filtration and Spirogyra sp algal biomass was covalently functionalized by polyethyleneimine (PEI) after glutaraldehyde crosslinking reaction. This reaction can take place between the aldehyde moiety of glutaraldehyde and the amine groups both PEI and algae. The surface properties of Spirogyra sp biomass were examined to identify the presence of various functional groups using Fourier Transformation Infrared Spectroscopy (FTIR). After polyethylene imine modification, the biosorbent showed a strong biosorption affinity to Cr(VI) compared to its pristine counterpart. The Cr(VI) ion removal was rapid, with more than 91 % of total biosorption realized in 20 min, and equilibrium was established about 40 min at pH 2.0. The adsorption process has been found to be endothermic for Cr(VI). The pristine and modified algal biomass preparations were regenerated using 0.1 M NaOH. In conclusion, it was observed that the algal biomass coated with polyethyleneimine is a promising, efficient, eco-friendly, cost-effective and biodegradable biosorbent for the removal of Cr(VI) from the environment and wastewater effluents.

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PP – 37

A Coprecipitation Strategy for the Separation-Preconcentration of Propineb in Environmental Samples

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In the presented work, a coprecipitation method was developed for separation–preconcentration, and determination of trace quantities of Propineb [polymeric zinc propylenebis (dithiocarbamate)] [(C5H8N2S4Zn)x] in water and vegetable samples. Propineb was coprecipitated by using $Al(OH)_3$ and detected the zinc in complex structure of propineb by flame atomic absorption spectrometry (AAS) has been developed. The propineb concentration was calculated by using stoichiometric relationship between the zinc and propineb.

Several parameters including the amount of aluminium as carrier element and hydroxide concentration, sample volume, and the effects of matrix ions were examined. The enrichment factor was calculated as 15. The limit of detection (LOD) value was calculated as 3.42 µg L^{-1}. The procedure was successfully applied to determination of propineb in water and vegetable samples.

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Removal of Pb(II) and Ni(II) Ions from Aqueous Solutions Using Pumpkin Peel Biochar

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Industrial wastewaters are one of the most important factors that cause serious heavy metal pollution in surface water bodies. The increase in heavy metal concentration in surface waters brings serious problems for the whole environment and threatens the health of living creatures in this environment[1]. Water is the basic need of all living things in nature and this need is increasing day by day[2]. However, the usable water potential is constant. For this reason, it is very important to clean polluted water as well as to prevent the pollution of our existing water resources. This is why heavy metals are at the forefront of the pollutant list that the water treatment industry and researchers work to find solutions for[2]. Adsorption technique is one of the most preferred methods among many traditional removal techniques such as filtration, electrocoagulation, precipitation, solid-phase extraction etc. for the removal of metal ions from aqueous solutions because of its cheapness, easy applicability and efficient performance[3]. The adsorbent is very important for cost and efficiency of the adsorption method. Although various adsorbents such as activated carbon[4], polymer-based adsorbents[5], and magnetic adsorbents[6] etc. have been reported for wastewater treatment, the tendency of researchers is to produce easy-to-obtain, inexpensive and environmentally friendly adsorbents[7] from agro-wastes.

In this study, pumpkin peel biochar was prepared for the batchwise removal of some heavy metal ions from aqueous solutions. The effects of parameters such as pH, contact time, initial metal concentrations on the uptake of some metal ions were investigated using pumpkin peel biochar. Langmuir and Freundlich isotherms were used for the analysis equilibrium conditions of Pb(II) and Ni(II) ions. The uptake kinetics of Pb(II) and Ni(II) ions by pumpkin peel biochar was analyzed with Pseudo-first-order and Pseudo-second-order kinetic models.

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Microbiological and Physicochemical Analysis of Water Used in Food Production Facilities in Akçaabat, Trabzon/Turkey

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What is the most essential source of life? When asked, of course, the first answer should be water. Water is absolutely needed for digesting edible and drinking foods, transporting digestive products, and removing waste from the body. For water to be used in a beneficial way, it must not contain harmful components in terms of physical, chemical, and microbiological aspects.

In this study, the results obtained by determining the microbiological and physicochemical contents of the waters used for various purposes by some food production facilities in Akçaabat district (Trabzon/Turkey) were interpreted. As microbiological contents, coliform bacteria, *Escheria coli* and fecal coliform contents were determined. The physicochemical contents are temperature, pH, dissolved oxygen, total alkalinity, carbonate, hardness, nitrate, nitrite, sulfate, ammonium, and chloride. In addition, analyzes of various metals contained in water were also made by microwave plasma atomic absorption spectrometry (MP-AES).

When the results obtained from the waters sampled twice in May and June 2021 are examined, it is noticed that the contents of the samples taken in June are generally higher than the samples taken in May. However, the contents of the samples taken in both periods did not exceed the limit values reported in the legislation. When the samples taken from 15 different food businesses were compared among themselves, it was determined that the samples generally showed a heterogeneous distribution. It was determined that some samples had very high values in terms of some parameters compared to others.

With this study, the quality of the water used in some food businesses operating in the Akçaabat district of Trabzon (Turkey) province was revealed in terms of chemical and microbiological content, and no dangerous results were found in terms of drinking and using.

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Method Validation and Measurement Uncertainty Calculations for Analysis of Calcium in Foods by Microwave Plasma–Atomic Emission Spectrometry (MP–AES)

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Method validation is the objective testing of the suitability of a method or measurement procedure for specified purposes and proving it with written evidence. The measurement uncertainty is a parameter that shows the distribution of probabilities that can be attributed to the measurement result reported together with the analysis result.[1,2]

For this purpose, method validation and measurement uncertainty calculations of the microwave plasma atomic emission spectrometer (MP-AES) device which has been used for mineral element and heavy metal measurements for more than 10 years were carried out for the Ca mineral in four different foods (cabbage, flour, fish, and juice). As validation parameters, limit of detection (LOD), limit of quantification (LOQ), repeatability, reproducibility, accuracy, and spiked/recovery tests were applied.

As a result of the studies, the LOD and LOQ values for Ca were determined to be 1.1 µg/L and 3.6 µg/L, respectively. Spiked/recovery studies at three levels were successfully performed in four food matrices. The pooled standard deviations of %RSDr(pool) and %HRSDr obtained as a result of repeatability studies were calculated as 1.395% and 2.233% for cabbage matrix, 1.833% and 2.321% for flour matrix, 1.672% and 2.124% for fish matrix and 1.665% and 2.538% for juice matrix, respectively.

Similarly, reproducibility studies were also carried out, and since the %RSDr(pool) and $\%RSD_R$(pool) values were smaller than the %HRSDr and $\%HRSD_R$ values, the results obtained from the studies were proven to be suitable for validation.

As a result of the validation studies for Ca mineral in four different food matrices, measurement uncertainty values were 2.52±0.13% for cabbage matrix, 0.192±0.020% for flour matrix, 419±21 mg/kg for fish matrix and 1.30±0.05 mg/L for fruit juice matrix. (k=2, expanded uncertainty at 95% confidence interval).

In conclusion, in this study, method validation studies and measurement uncertainty calculations were performed for Ca mineral in foods using selected food matrices in the MP–AES device. The method has been validated and the accurate and reliable interpretation of the data obtained from the device has been ensured.

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Identification of Microplastics Using C.I. 51030 and C.I. 51175 Fluorescent Staining

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Microplastics is a general name given to those plastic particles with a 1–20 µm lower and 500 µm–5 mm upper diameter range.[1] Microplastics pollution, frequently detected in food chain, waters, cosmetic products, drug substances and atmosphere in the recent years, has harmful effects mainly in two categories such as being exposed to these (by eating or swallowing) and secondary effects in the organisms (such as disturbing effects on endocrine glands).[1] Even though polyethylene (PE) and polypropylene (PP) particles were initially accepted as bioinert in the recent years they are shown to have responsibility on oxidative stress in coronary arteries, cerebrospinal fluid and brain.[2] An average European citizen is exposed to $11x10^3$ pieces of microplastics per year only by consuming mussel.[2] Thus determination and discrimination of microplastics is currently an important issue and their determination is performed spectrofluorimetrically by Nile red (C.I. 51180) staining.[3]

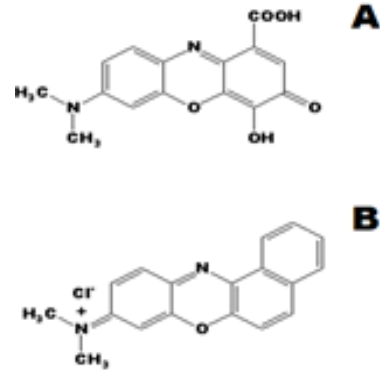

Fig. 1. Chemical structures of Gallocyanine(A) and Meldola's Blue(B).

In our approach different from literature PE microparticles were discriminated and determined successfully with inverted fluorescence microscope by gallocyanine (C.I. 51030) and Meldola's blue (C.I. 51175) staining. Wavelengths used for fluorescence determination were λ_{EX} 292 and 567 nm, while λ_{EM} 490 and 620 nm for gallocyanine and Meldola's blue, respectively. Spectrofluorimetric determinations were performed with Perkin Elmer LS 55 spectrofluorimeter and Olympus IX71 Inverted Fluorescence Microscope. FT-IR determination was performed with Perkin Elmer Spectrum 100 spectrometer and ATR probe. After optimization studies, best staining procedure was achieved with acetonitrile (ACN) as optimum solvent and $5x10^{-4}$ M as optimum dye concentration.

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