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May 17-21, 2023

BOOK OF ABSTRACTS

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SARAJEVO, BOSNIA AND HERZEGOVINA ON MAY 17-21, 2023

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Prof. Dr. Özer Çınar

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*On behalf of the organizing committee, we are pleased to announce that the 7th International Conference on Environmental Science and Technology (**ICOEST-2023**) is held in **Sarajevo, Bosnia and Herzegovina on May 17-21, 2023.** ICOEST provides an ideal academic platform for researchers to present the latest research findings and describe emerging technologies, and directions in Environmental Science and Technology. The conference seeks to contribute to presenting novel research results in all aspects of Environmental Science and Technology. The conference aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results about all aspects of Environmental Science and Technology. It also provides the premier interdisciplinary forum for scientists, engineers, and practitioners to present their latest research results, ideas, developments, and applications in al lareas of Environmental Science and Technology. The conference will bring together leading academic scientists, researchers and scholars in the domain of interest from around the world. ICOEST is the oncoming event of the successful conference series focusing on Environmental Science and Technology. The scientific program focuses on current advances in th eresearch, production and use of Environmental Engineering and Sciences with particular focus on their role in maintaining academic level in Science and Technology and elevating the science level such as: Water and waste water treatment, sludge handling and management, Solid waste and management, Surface water quality monitoring, Noise pollution and control, Air pollution and control, Ecology and ecosystem management, Environmental data analysis and modeling, Environmental education, Environmental planning, management and policies for cities and regions, Green energy and sustainability, Water resources and river basin management. The conference's goals are to provide a scientific forum for all international prestige scholars around the world and enable the interactive exchange of state-of-the-art knowledge. The conference will focus on evidence-based benefits proven in environmental science and engineering experiments.*

Best regards,

Prof. Dr.Özer ÇINAR

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NOVEL METHOD FOR THE EXTRACTION AND IDENTIFICATION OF MICROPLASTICS IN BRANDED MILK

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Abstract:

The issue of global contamination with microplastics (MPs) has become a critical issue globally due to high levels of MPs in various ecosystems and certain food products. This study aims to investigate the presence of microplastics in branded milk, in terms of chemical composition and toxic effect on humans. An absolute novelty of this study consisted in the development of a method for isolating the microplastics from the matrix of the branded milk samples using ultrasound technique at constant temperature and pressure, high-performance vacuum filtration method with various high-purity filtration membranes (e.g., cellulose, glass fiber, quartz, nylon, or polytetrafluoroethylene - PTFE). The milk samples selection was based on the quality offered by the producers, the popularity of the brand, the purchase degree, the type of packaging and the product cost. The samples were purchased from hypermarkets of Romania, the fat content varied between 1.5-3.8%, Tetra Pack, plastic or glass packaging. A total of 10 different brands were chosen for this study. The samples were divided into two categories (non-Bio and Bio milk). On the other hand, the combined application of the structure sensitive technique Fourier-transform infrared µ-spectroscopy in conjunction with different approaches of optical microscopy and scanning electron microscopy - energy dispersive spectroscopy (SEM-EDS), was a significant objective of this study, to elucidate the type, structure, and chemical composition of MPs. Microplastics were identified in all 16 analyzed samples (10 non-Bio milk samples and 6 Bio milk samples). Regarding the total number of microplastics identified in the two types of milk (non-Bio and Bio), the Bio milk samples recorded a higher total number of microplastics (166 polymer fibers), compared to the non-Bio milk samples (143 polymer fibers); the identified colors were black (mostly), blue, yellow, brown and red. By analyzing the MPs sizes was observed that length varied from tens of micrometers to a few centimeters in some cases and the thickness reached 15 µm and even more for various samples. From visual and chemical point of view the structure was mostly like polypropylene wires but smaller and having glossy mate or transparent appearance. The MPs investigated by SEM-EDS have a filiform structure, their morphology being similar. This morphology is characterized by finely textured surfaces with medium roughness and shows longitudinal microcracks. The EDS results identified the presence of C, O, Na, Mg, Al, Si, P, S, Cl, K, Ca, and Ti on the surface of the microplastics. Most of the elements identified in concentration less than 5% represent milk constituents. Likewise, the presence of aluminum and titanium can be explained by the way the milk is packaged, by some pigments used to color the polymer or by the accidental ingestion.

Acknowledgement: This work was supported by the Ministry of Research, Innovation and Digitization, (Institutional Development Projects - RDI Excellence Financing Projects), through the project 43PFE/30.12.2021.

Keywords: Microplastic, Contamination, Milk, Optical Microscopy, SEM-Eds

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ASSESSMENT OF MICROPLASTICS IN PERSONAL CARE PRODUCTS BY MICROSCOPIC METHODS AND VIBRATIONAL SPECTROSCOPY

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Abstract:

The cosmetic sector is one of the growing sectors worldwide. In Europe, substances used in cosmetic products are subject to the application of the REACH Regulation. This implies that, for each substance present in a cosmetic formula, a risk assessment for the environment and human health should be carried out. Especially for personal care and cosmetic products, there is evidence of their environmental risk and therefore, is deeply necessary to introduce eco-design and green chemistry strategies for their production and use. Primary microplastics, called microbeads (µBs), are found in personal care and cosmetic products (PCCP) being used as an ingredient capable of physical abrasion on a certain surface (mainly teeth and skin). Due to their durability, cost-effectiveness, and performance over time, µBs have replaced natural materials such as inorganic powders, naturally introduced fruit peels and seeds, sometimes crushed in cosmetic care products. The main problem related to the presence of µBs in the environment is their size (less than 0.8 mm, sometimes even less than 0.1 mm); thus, they can be ingested by many organisms, being transmitted in the food chain. The development of a method for isolating the microplastics from the matrix of branded PCCP samples (i.e., shower gel, body spray, and micellar water) using ultrasound technique at constant temperature and pressure, high-performance vacuum filtration method with various high-purity filtration membranes (e.g., cellulose) was the first objective of this study. The second objective was to combine the vibrational spectroscopy techniques (Raman and Fourier-transform infrared µ-spectroscopy) with optical microscopy and scanning electron microscopy - energy dispersive spectroscopy (SEM-EDS), to investigate the morphology and chemical composition of µBs. Microplastics were identified in all nine brands of analyzed products, thus 92 µBs in shower gel, 147 µBs in micellar water and 68 µBs in body sprays; the identified colors were black (mostly), blue, yellow, brown, green and red. The observed sizes varied from tens of micrometers to a few centimeters in some cases and the thickness reached 10 µm. From visual (microscopy) and chemical (µ-FTIR and Raman spectroscopy) point of view the structure was mostly like polypropylene fibers, smaller and having glossy mate appearance. Considering the fact that a series of plastics added to cosmetic products as abrasives (e.g., ethylene/propylene copolymer, polylactic acid, hydrogenated poly(olefin C6-20), polyethylene, copolymer 1,4-butanediol/succinic acid/adipic acid/HDI (hexamethylene diisocyanate polymer), ammonium acryloyldimethyltaurate copolymer/ laurethyl-7 methacrylate) must be eliminated by 2030 according to EU recommendations (CosIng, CIR–Cosmetic Ingredient Review), it is imperative to carefully monitor the chemical composition of all cosmetic products, especially in terms of microplastics chemical composition.

Acknowledgement: This work was supported by the Ministry of Research, Innovation and Digitization, (Institutional Development Projects - RDI Excellence Financing Projects), through the project 43PFE/30.12.2021.

Keywords: Microplastics, Contamination, Personal Care Product, FTIR, SEM-Eds

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SOIL FUNGAL DIVERSITY UNDER WEST AFRICA ECTOMYCORRHIZAL VEGETATION

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Abstract:

In West Africa, the forests are rich in ectomycorrhizal fungi (ECM) and contain many tree species that form symbiotic interactions with these fungi. Through this symbiosis, ECM fungi facilitate plant growth by increasing the absorption of nutrients and water. The objective of this study is to estimate the diversity of soil fungal species. We sampled in Benin and on these samples DNA was extracted to characterize the soil fungal community in woodland savannas dominated by the tree species Isoberlinia doka, Isoberlinia tomentosa and Uapaca togoensis. For Molecular Analysis, the Internal transcribed spacer (ITS) region was sequenced to infer phylogeny for all soil fungal species detected.

The results show that the type of vegetation significantly influences the structure of the ECM fungi community and remains more dominant under Isoberlinia doka than other vegetation. We conclude, the soil fungal community under Isoberlinia doka is more abundant and more diverse and more structured.

Keywords: Ecology, Soil, Fungal Community, West African Forest

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IDENTIFICATION OF KEY PERFORMANCE INDICATORS USING DELPHI METHOD FOR INTEGRATION OF URBAN WATER SUPPLY SYSTEM, PLANNING AND MANAGEMENT

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Abstract:

The water crisis in urban areas has emerged as a critical issue as a consequence of rampant urbanization, climate change, pollution, improper planning and management of water resources, and population growth. To ensure water security, it is essential to integrate urban water supply systems, water supply planning, and water supply management. The water supply system considers the various sources of water such as groundwater, surface water, wastewater, stormwater, etc, Water supply planning considers the water distribution systems and their integration with spatial planning for ensuring present and future water security and Water supply management focus on allocation, distribution, and management of water resources. The research uses the Delphi method for the selection of various key performance indicators when considering the three aspects of urban water. A systematic literature review was initially conducted for water supply systems, planning, and management followed by three rounds of Delphi Survey among 30 experts in the field of urban planning, Civil and environmental engineering. After the third round of the survey, maximum consensus, with Kendall's coefficient of 0.748 was achieved for 72 key performance indicators. A strong consistency of ranks was observed in rounds 2 and 3 surveys, with spearman's coefficient of 0.882. The identified key performance indicators can be further used for any study dealing with the integration of urban water supply systems, planning, and management.

Keywords: Delphi Method , Water Supply System , Water Supply Planning , Water Supply Management

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WATER SECURITY IN URBAN INDIA AND THE WAY FORWARD – CASE OF DELHI AND RANCHI

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Abstract:

Climate change, along with urbanization and population growth, has escalated issues related to floods, droughts, water scarcity, and water quality. The Global Water Institute, in 2013, estimated that approximately 700 million people in 43 different countries were facing water stress and scarcity. In India, pollution of water resources and increased demand and consumption has been one of the major factors behind water insecurities. The research aims to understand water security in urban India and measures to augment water security. The objectives of the research are to understand the impact of the over-extraction of groundwater in urban areas and identification of suitable nature-based solutions to overcome the impending scarcity of groundwater resources. Descriptive analysis has been conducted to assess the dependence on surface and groundwater in 2 Indian cities, i.e., Delhi and Ranchi. The selected cities have different surface water sources; in the case of Delhi, water is supplied from River Yamuna, Ganga, and Bhakra storage, whereas in the case of Ranchi, water is supplied from 3 dams (Getalsud dam, Kanke dam, and Dhurwa Dam). In both cities, a certain percentage of water demand is fulfilled from these surface water sources, and the remaining water requirement is dependent on groundwater. Nature-based solutions (NBS) or Natural water retention measures (NWRM) can prove to be a helpful tools in recharging and improving the groundwater table. NBS / NWRM can also help in the mitigation of flood risk and further contribute to the preparation of catchment management plans and river basin management plans.

Keywords: Water Stress , Water Scarcity , Water Security , Nature Based Solutions, Ground Water

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HEAVY METALS CONTAMINATION ASSESSMENT OF SOILS AROUND ZEIDA ABANDONED MINE (EASTERN MOROCCO)

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Abstract:

In Zeida abandoned mine (located in the Eastern Morocco), some soils were sampled over 1600 m in the wind flow lines and far from a mining waste tailing, considered as a pollution source, this in order to evaluate the contamination levels of soils by some heavy metals and metalloids. The chemical analyses done by XRF, show values that exceeded the chemical background (E-REF) and specially near to the mining waste tailing, indicating that mining residues have caused a negative impact on the whole ecosystem. The correlation matrix of all chemical elements reveal significant correlation values for Pb-As (1), Pb-Cu (0.930) and Pb-Zn (0,862), which suggests that those elements are associated in the same mineral phases. The pollution indices were calculated in order to determine the contamination risk assessment of the studied soils in the wind line. Based on Enrichment factor (EF), the studied soils show very high values for Pb and As. According to Contamination factor (CF), Pollution load index (PLI) and Geo-accumulation Index (Igeo), the soils located far from the tailing considered as a pollution source are poorly contaminated by Pb and the As. The Potential Ecological Risk (PER) calculated for As and Pb show a moderate contamination level. These results give useful information for developing an ecological management strategy to reduce the impact of heavy metal contamination from an abandoned mining site such Zeida, as well as other similar mining areas.

Keywords: Zeida Mine, Contamination, Heavy Metals, Tailing, Soil, Morocco

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NEW OPPORTUNITIES PROVIDED BY DEVELOPMENTS IN MARITIME COMMUNICATION SYSTEMS FOR THE EFFECTIVE MANAGEMENT OF COASTS

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Abstract:

In recent years, developments in communication systems, one of the two basic elements of the information sector, provide great opportunities in the effective control and supervision of the seas and coasts, as in all sectors. In particular, developments in wireless communication systems provide many new opportunities for countries in the effective management of their coasts. These developments in communication systems lead to marine pollution, safety of life and property in the seas, irregular migration, effective use of maritime transport in transportation, maximum utilization of seafood, etc. in the surrounding seas of the countries. It provides very important opportunities in many areas. It also offers highly developed infrastructures to coastal administrations in these matters. As it is known, the uncontrolled migration movement, which has been accelerating in the past few years and has become an important problem even for countries that do not have a coast, is carried out by sea to a very significant extent. For this reason, the security of the coasts has ceased to be a problem only for the countries with a coastline, and has led to the fact that coastal management has become an international study. In addition, in our world where natural resources are gradually decreasing, the cleaning of the seas and the maximum and effective use of the opportunities offered by the seas have become one of the most important areas of interest of the countries. On the other hand, developments in technology in recent years offer very important opportunities to countries in all these matters. Especially the new possibilities provided in wireless communication and the use of data communication in these systems also allow the automatic collection and evaluation of many data that could not be obtained instantly. Again in recent years, the development of data communication in the VHF system, which is defined as short-distance maritime communication devices, and the shifting of existing VHF channels to data communication to a great extent, provides a very important contribution to the technical infrastructure in this regard. All these developments make very positive contributions to the fact that the authorities of the country can easily monitor the above mentioned issues, especially the pollution of the surrounding seas, and to manage the coasts effectively.

Keywords: Communication Systems, Sea Pollution, Marine Pollution, Coastal Management, AIS Systems

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NET ZERO WATER BUILDING

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Abstract:

Water is essential for human life, health and overall well-being, i.e. to reduce poverty and hunger. As day after day the earth's population and the need for water are increasing, whereas the amount of water is decreasing, it is becoming increasingly difficult to satisfy people's water needs. Due to the trend of urban population concentration, it can be said without exaggeration that the functioning of cities will also depend on the quantity and quality of management and distribution of water resources within cities. Drinking water from public water supply system is used in households to cover all types of daily water needs. In order to preserve water as much as possible, in terms of its quality and quantity available for human consumption, an integrated approach to water management is needed. Integral water management is essentially water production and consumption management. Zero-use water building is a building that collects rainwater and recycles its waste water for reuse, eliminating the need for water supply from public water supply and connection to the sewer network. Appropriately collected and stored rainwater can be used multiple times in dwellings, gardens, yards, parks, for washing public areas, etc. The benefits of rainwater use are ecological and financial. A zero-water building is technologically feasible for existing buildings, but costs are quite high, and various other constraints also arise. This approach is most suitable for new buildings, where space for containers, additional pipelines and filtering systems can be set from the beginning. Zero-water buildings aim to reduce total water consumption, maximise the use of alternative water sources and minimise waste water discharges from buildings. The paper will present the general concept of zero-water buildings and highlight the importance of water conservation.

Keywords: Net Zero Water Building, Sustainability, Water, Water Consumption

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CAPITAL STRUCTURE AND USE OF RASPBERRY-GROWING ENTERPRISES IN BOSNIA AND HERZEGOVINA: JELJZNO POLJE EXAMPLE

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Abstract:

The study's primary purpose is to determine the capital structures or raspberry production enterprises in Jeljezno Polje. It is very important for agricultural enterprises to be able to offer financing opportunities and credit resources to individual producers with the most appropriate opportunities. The data in the study are refered to the 2021 production year. It was obtained by survey method from 91 enterprises, which were determined with a 5% error at he the 95% confidence limit according to the stratified random sampling method. In the research, the enterprises examined in the field were classified according to their capital structure and functions and the average active capital of the enterprises was calculated as 19.179,93 $. The ratio of active capital consists of 74,95% of land capital, 18,08% revolving working capital and 6,97% fixed working capital. It has been determined that raspberry enterprises generally do not use loans but work with their own capital. There is no similar study conducted in the research area. This article will give an important contribution to the literature.

Keywords: Raspberry Enterprise, Capital, Jeljezno Polje

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DISTRIBUTION, ENVIRONMENTAL AND POTENTIAL HUMAN HEALTH RISK ASSESSMENT OF PCDD/FS AND DL-PCBS IN THE SURFACE SEDIMENTS OF SEVERAL WATER RESOURCES IN TEKIRDAG PROVINCE, TURKIYE

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Abstract:

This study demonstrates that the determination of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-p-furans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (DL-PCBs) pollution levels in the surface sediments that were taken from four dam/ponds providing drinking water and irrigation from Tekirdag. Also, the acquired concentration levels were carried for out to environmental and potential human health risk assessment. The analysis of PCDD/Fs and DL-PCBs congeners in the surface sediments was performed with high-resolution gas chromatography-mass spectrometry (HR-GC/MS) at a resolution of >10,000. The concentrations of PCDD/Fs and DL-PCBs ranged from 0.98 to 43.57 pg/g d.w. (average 12.17 pg/g d.w.) and 9.78-70.94 pg/g d.w. (average 34.18 pg/g d.w.), respectively. The congener distributions indicated that the OCDD was dominant (58.46 %) in PCDD/Fs, while PCB 118 (41.58%), PCB 105 (24.67%) and PCB 167 (13.64%) were the dominant in DL-PCBs. The highest contamination level of PCDD/Fs was seen at Turkmenli Pond (T3-T4) (∑PCDD/Fs = 32.85 pg/g d.w.) where many industrial companies are near at the pond followed by Yazir Pond (T5-T6) (∑PCDD/Fs = 5.95 pg/g d.w.) among the investigated sediments. The calculated diagnostic ratios implied that these pollution sources in these ponds are directly related to the air pollution caused by the traffic (close to European highway E84) and combustion for home heating as well as industrial facilities. The TEQ values of PCDD/Fs (0.097-1.140 pg TEQ/g) and DL-PCBs (0.012-0.066 pg TEQ/g) in most of the sediments are below the recommended safe threshold levels for ecological risk regulations, however the T4 sediment has total dioxin-like toxicity higher than the threshold level (0.85 pg TEQ/g). Conversely, the results of potential human health risk calculations (HQ, HI, LCR and TLCR) indicated that there is no risk for both children and adults. These results do not lead to any dangerous or adverse effects on the aquatic environment.

Keywords: Dam Lake, Pond, PCDD/Fs, DL-Pcbs, Surface Sediment, Risk Assessment

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SUSTAINABLE DESIGN AND MAINTENANCE OF BUILDINGS

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Abstract:

The world's population is increasing, hence the need for enlarged accommodation and the construction of buildings. Therefore, the amount of wastewater is increasing. Nature areas (lawns, arable land, forests, etc.) are used to build buildings. In this manner, natural surfaces become impermeable, which leads to natural unbalance. The heat islands get created, temperatures and rainfall runoff into the sewerage system increase, plus consequences of climate change generally increase. The construction industry is one of the biggest polluters in the world. With sustainable construction, it is possible to reduce the negative impact on the environment. The principles of sustainable construction should be applied to all phases of the life cycle of a building: design, construction, maintenance, and removal of the building. In the construction design phase, it is possible to modify the building with a slight increase in cost, which will lower future maintenance costs. It is essential to use materials thoughtfully through construction since people spend a large part of their time indoors. Environmental impact assessment is the basis of sustainable design, construction, use, and disposal of the building. Of course, various social issues involve the health and well-being of building users. We must not forget the economic aspects and the total costs of the building. This is where the concept of green construction comes into play. Green building refers to both a structure and the application of environmentally responsible and resource-efficient processes throughout a building's life cycle. Green building also refers to saving resources to the maximum extent, including energy, land, water and material saving, etc., during the whole life cycle of the building, protecting the environment and reducing pollution, providing people with healthy, comfortable and efficient use of space, and being in harmony with nature.

Keywords: Design, Green Building Certifications, Maintenance, Management, Sustainability

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CARBON FOOTPRINT ESTIMATION IN ROAD CONSTRUCTION: CASE STUDY OF KARAMAN-MERSIN

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Abstract:

There are two main methods to combat climate change reduce the effects or stop it, even to avoid worst-case scenarios; moving to on low carbon economy and protecting forests, meadows and pastures, which are the most effective natural sinks in the fight against climate change for that reason. It is an urgent necessity to greatly reduce greenhouse gas emissions and reduce the carbon footprint of every segment, from individuals to sectors and cities in order to minimize global warming and maintain a sustainable life, it is necessary to calculate the carbon footprint and set a rood map to reduce it and to control the sink areas for carbon neutralization. Briefly, the carbon footprint is an estimation and explanation of the damage caused by the greenhouse gas produced in terms of carbondioxide to the enviroment. In this study, the calculation of the carbon footprint, the creation of carbon hot spots and the determination of which measures should be taken for carbon reduction in the road construction site, which is one of the most important carbon saurces, with a ready-mixed concrete plant and tunnel and viaduct construction activities, and it was also aimed that circular economy with the green energy determined for the applicability of that measures. For this purpose, the carbon footprint was determined according to the ISO 14064 standard based on the method, coefficient and methods published by internationally recognized institutions such as DEFRA and IPCC, an the footprint of the road construction sector was calculated and estimated between Karaman and Mersin in Turkey. Accordingly, a roadmap has been set through methods such as carbon reduction, changes in production prosesses, recycling applications according to the determined hot carbon spots.

Keywords: Construction Sector, Road Construction, Greenhouse, Carbon Footprint

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ELECTROCHEMICAL H2O2 PRODUCTION WITH GRAPHITE CATHODE FOR ANODIC OXIDATION TREATMENT

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Abstract:

The increase in population in the world and the development of technology have brought many environmental problems to the agenda. Water is the basic need for sustaining life. Many pollutants come from conventional wastewater treatment plants. Some of these pollutants cannot be treated in conventional treatment plants because they are not biodegradable. After these untreated pollutants are discharged, they pose a great danger to the creatures living in the aquatic ecosystem. In cases where conventional wastewater treatment plants are insufficient, advanced oxidation processes are a good alternative method for treatment. The anodic oxidation process, which is among the advanced treatment technologies, is an effective method used for the removal of non-biodegradable pollutants. In this study, anodic oxidation was studied by using a boron-doped diamond (BDD) anode and a graphite cathode. The purpose of the study is to determine the amount of hydrogen peroxide (H2O2) electrogenerated by graphite cathode. Graphite is known to produce high amounts of H2O2 in an aqueous solution by means of electrochemical reactions. In the experiments, the parameters that are effective in the production of H2O2 from graphite were investigated. These parameters were chosen as pH, air flow rate, supporting electrolyte concentration, and applied current. Experiments were performed at room temperature. At the end of the study, 121.5 mg/l H2O2 was reached as the highest amount at pH 2, with the applied current of 60 mA, 0.1 L/min air flow rate, and 50 mM supporting electrolyte concentration.

Keywords: Hydrogen Peroxide (H2O2), Graphite, Anodic Oxidation, Wastewater

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REMOVAL OF DICLOFENAC FROM WASTEWATER BY MEANS OF ELECTROCHEMICAL OXIDATION METHOD

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Abstract:

Recently, drugs are seen as one of the most important pollutants encountered in wastewater treatment plants and most of these substances are not biodegradable. These non-degradable pollutants are directly discharged into aquatic environments without proper treatment due to their durable structure to conventional treatment systems. It has been proven by scientific studies that these pollutants are extremely harmful to aquatic life and the environment. Diclofenac is a drug active ingredient and its biological treatment is quite difficult. Removal of non-biodegradable Diclofenac-like drugs can only be completely mineralized by advanced treatment techniques. Hence, electrochemical processes are widely used in the removal of these drug-active ingredients. Direct or indirect electrooxidation is the most used method for the removal of non-biodegradable substances. This study evaluates removing of diclofenac by anodic oxidation method, which is a direct electrooxidation process. For the anodic oxidation of diclofenac, an anode is a boron-doped diamond (BDD) and the cathode electrode is graphite was used. The best operational conditions for electrochemical treatment were determined by controlling the current, pH, pollutant concentration, supporting electrolyte concentration, and airflow rate during the 100-minute experimental study. Experiments were performed at room temperature. Optimum conditions; pH 6, with the applied current of 150 mA, 0.5 L/min air flow rate, 75 mM supporting electrolyte concentration and 200 µm diclofenac concentration. Experimental findings showed that 82% of diclofenac was removed with BDD anode and graphite cathode at the optimum conditions. According to the results, diclofenac, as an inorganic pollutant, can be effectively mineralized by anodic oxidation process in a short electrolysis time.

Keywords: Diclofenac, Anodic Oxidation, Boron Doped Diamond, Graphite, Wastewater

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THE GREYWATER FOOTPRINT CALCULATION OF ERZURUM CITY'S URBAN WASTEWATER

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Abstract:

Water is essential for the continuation of human life. Therefore, it becomes important to conduct scientific studies on water management due to the increasing world population day by day, rapidly growing industries, chemical pollution, global warming, drought, etc. The water footprint is one of the methods used to calculate the consumption volume of water directly and indirectly and to manage water resources. Within this context, the concept of water footprint is a pressure indicator developed to reveal how people's choice make about production and consumption affect natural resources. It reveals the pressure on environmental resources how much pollution is caused and how much water is used for our needs in our daily lives. Knowing how much water is consumed in any process is important for the effective, conscious, and sustainable use of water. The water footprint has three components: blue, green, and grey; calculating and assessing the Water Footprint is important in terms of evaluating the sustainable, efficient, and fair use of water. Gray Water Footprint is related to the production stage, and it is defined as a degree of water pollution resulting from production activities. This study aims to calculate the greywater footprint of Erzurum City's domestic wastewater and to reveal the pollution caused by the wastewater discharged to the Aras River after being treated in Erzurum Biological Wastewater Treatment Plant.

Keywords: Water Footprint, Erzurum Wastewater Treatment Plant, Greywater

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ECONOMIC ANALYSIS OF ACTIVATED CARBON PRODUCTION

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Abstract:

This study describes the characteristics, production process, and different applications of activated carbon. Activated carbon is a porous solid substance that can interact with different types of molecules due to its physical or physical-chemical structure. Its production process typically involves a two-stage carbonization process, in which the raw material is heated to high temperatures in the absence of oxygen and then activated by further heating with oxidizing agents. The choice of raw material affects the internal pore structure, surface area distribution, and surface chemistry of the final product. Activated carbon can be produced in different forms such as powder, granules, or pellets, each of which has specific uses in different industries. Activated carbon has become an essential material for many industries due to its high adsorption capacity, porous structure, and versatility. The choice of raw material and production process can lead to variations in its physical and chemical properties, making it adaptable to different applications. Activated carbon is a valuable material for air and water purification, as well as in mining, chemical, and pharmaceutical industries. For larger production volumes, average product yields and combustion values were measured to complete cost analysis. Additionally, an iterative process was applied to increase product yield and maximize cost-effectiveness by optimizing production-related parameters. The data obtained from this stage will be used to determine the fundamental parameters and quality control characteristics for subsequent plant design. In 2021, the global activated carbon market size was estimated to be approximately $3.3 billion and is expected to reach $5.1 billion by 2028 with a compound annual growth rate of 6.2%. The increasing demand for activated carbon in environmental applications is driving market growth.

Keywords: Activated Carbon, Economic Analysis, Water Treatment

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THE PILOT IMPLEMENTATION OF DEPOSIT RETURN SCHEME IN TURKEY FOR INCREASING RECYCLING RATES

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Abstract:

It was conducted an evaluation of the applicability of DRS, which was started to be implemented on a pilot scale in Ankara Province Kizilcahamam District in July 2022 within the scope of the Turkey Deposit Return System Project put into effect by the Ministry of Environment, Urbanization and Climate Change in January 2021, taking into account the domestic waste and zero waste practices based on the 6-month data of the wastes separately collected glass, plastic and metal beverage packaging with DRS. Since 2020, domestic wastes have been separately collected in accordance with zero waste regulation in the region as well. The district was determined as a DRS pilot region in June 2022 as well. For this purpose, deposit return machines (DRM) have been placed at 5 different points in the district center and, the amount of 6-month packaging waste collected from the DRMs until the end of 2022 were used as thesis data. In addition, the recyclable wastes collected within the scope of zero waste implementations in the district for the last three years and total domestic wastes are also included in the study. It was seen that wastes were collected according to zero waste implementations in 2020, 2021 and 2022 in Kizilcahamam District, but the separate collection rate of recyclable packaging waste in these three years remained between 7-10% compared to domestic waste. The DRS application from July 2022 until the end of December 2022 was found very attractive by the public, and nearly six tons of beverage packaging waste was collected separately in a short period of six months, with a result close to one hundred percent (from 560 kg to 5.6 tons). Considering that organic wastes and construction wastes are included as the recyclable wastes collected separately with the zero waste application, it is evaluated that the DIS application has had a significant success in a short time.

Keywords: Deposit Return Scheme, Zero Waste, Recycling

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EFFECT OF DRAW SOLUTION CONCENTRATIONS ON THE MEMBRANE FOULING OF ANAEROBIC MICROFILTRATION OSMOTIC MEMBRANE BIOREACTORS

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Abstract:

Anaerobic microfiltration osmotic membrane bioreactors (AnMF-OMBRs) have gained considerable importance in recent years. The AnMF-OMBR has been developed to prevent salt accumulation by adding a microfiltration (MF) membrane into the anaerobic osmotic membrane bioreactor (AnOMBR). Despite this modification, the AnMF-OMBR still has issues such as microbial inhibition caused by high salinity and membrane fouling. Up-flow anaerobic sludge blanket microfiltration osmotic membrane bioreactor (UASB MF-OMBR) systems have been revealed to avoid these issues. In this paper, laboratory scale AnMF-OMBR and UASB MF-OMBR systems treating slaughterhouse wastewater were operated using MgCl2 as draw solution (DS) in different salt concentrations (0.47, 1, and 1.5 M). The effects of DS concentration on forward osmosis (FO) membrane fouling were investigated for both systems. Membrane autopsy analyses were performed for the fouled FO membranes that used at different DS concentrations. Atomic force microscopy (AFM), scanning electron microscope-energy dispersive X-ray spectroscopy (SEM-EDX), fourier-transform infrared spectroscopy (FTIR), and confocal laser scanning microscopy (CLSM) measurements were carried out for fouling characterization. The AFM results indicated that fouling on the membrane surface increased with increasing DS concentration for both systems. Also, the CLSM indicated that the thickness of the biofouling layer on the FO membranes belonging to both reactors aggravated when the DS concentration increased. Furthermore, the FO membrane of UASB MF-OMBR had less biofilm layer and the design of the reactor can effectively prevent the biofoulants deposition on the membrane surfaces. The FTIR spectra showed new absorption peaks related to protein substances on the fouled FO membranes of both reactors. As a result, compared with the AnMF-OMBR, the FO membrane in the UASB MF-OMBR had less fouling due to the novel reactor configuration.

Keywords: Draw Solution, Anmf-OMBR, UASB MF-OMBR, Membrane Fouling

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EVALUATION OF MEMBRANE FOULING IN BATCH FORWARD OSMOSIS PROCESS TREATING SLAUGHTERHOUSE WASTEWATER

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Abstract:

Forward osmosis (FO) is a membrane process for wastewater treatment and resource recovery with significant advantages such as high rejection of contaminants and low energy requirement. However, membrane fouling is a major issue for the application of the FO process in these applications. This study aims to determine the effect of the draw solution (DS) on membrane fouling in batch FO processes treating slaughterhouse wastewater. 6-hour batch FO studies were carried out using MgCl2 as the draw solution (DS) in different concentrations (0.47, 0.75, 1, 1.5, 2 M), and the synthetic slaughterhouse wastewater as the feed solution (FS). A cellulose triacetate (CTA) membrane was used as FO membrane. Membrane autopsy studies containing scanning electron microscopy (SEM) with energy dispersive X-ray analysis (EDX), atomic force microscopy (AFM), Fourier-transform infrared spectroscopy (FT-IR), and contact angle were performed on clean and fouled FO membranes after the batch FO studies with MgCl2. The SEM analysis demonstrated that there were precipitates on the membrane surface, but the helical structure of the membrane was not disturbed and fouling occurred in the membrane pores and surface. The data obtained from EDX analysis revealed an increase in the percentages of Mg and Cl (wt%) with increasing DS concentrations. In the FT-IR analysis, it was determined that the increase in DS concentrations did not cause a significant change in the membrane structure, and did not have sufficient effect to change the FT-IR spectra. The contact angle studies on the fouled FO membranes showed that the contact angle value increased with increasing DS concentrations, and thus the membrane became more hydrophobic. As a result of the AFM analysis, salt accumulation was observed on the membrane surface, and the Rrms value increased with increasing DS concentrations together with the rougher surface structure.

Keywords: Forward Osmosis, Membrane Autopsy, Membrane Fouling, Slaughterhouse Wastewater

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LIFE CYCLE ASSESSMENT FOR SUSTAINABLE SOLID WASTE MANAGEMENT IN ERZURUM CITY

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Abstract:

Waste amount has increased and solid waste management has become an important environmental issue with the increase in population and the change in social living conditions.

Solid wastes are defined as solid materials that are intended to be disposed of by the manufacturer and that must be disposed of regularly, especially in terms of environmental protection. In this point, it is necessary to ensure that solid wastes are collected, transported, stored and disposed without harming the environment. Therefore, solid waste management is important in terms of controlling environmental impacts. Life Cycle Assessment (LCA) is a method that measures the environmental impact of products or systems throughout their life cycle. Working with a cradle-to-grave approach, LCA starts from raw material supply and continues with production, transportation, consumption and waste generation. Evaluation of products and services throughout their life cycles provides an opportunity to evaluate the environmental impacts of the decisions. The aim of this study is to develop a LCA framework that enables a sustainable solid waste management system for Erzurum City. Thus, it can be developed a road map to reduce environmental pressure caused by solid waste. Finally, a Solid Waste Life Cycle Assessment (SWLCA) analysis will be carried out for solid wastes generated in Erzurum landfill. The SWLCA system, which will be implemented for a determined process, consists of the stages of defining the processes, identifying inputs and outputs, and evaluating the environmental effects.

Keywords: Solid Waste, Erzurum Province, Life Cycle Analysis.

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ADAPTABILITY OF FIVE MUSHROOM SPECIES TO THE URBAN ENVIRONMENT

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Abstract:

The mushrooms are living organisms with excellent capability to adapt to the diverse challenges of their environment. There are several species that are well represented in urban green areas (parks, green spots, and recreation grounds). We investigated the influence of the urban environment over two saprotrophic (Bovista plumbea, Lycoperdon perlatum) and three mycorrhizal (Amanita rubescens, Russula cyanoxantha, Suillus granulatus) species commonly present in urban parks of Cluj-Napoca, a major city of Romania. Three control sites close to the city and suitable for these species were chosen. We quantified 19 elements (Ag, Al, Ba, Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, S, Si, Sr, Ti, Zn) in the fruiting bodies of mushrooms by ICP-OES technique. S. granulatus was the most sensible species to the urban pollution; for example accumulated 130 mg/kg Al, and 4.40 mg/kg Ni, given for dry weight. R. cyanoxantha had the highest Na concentration in both habitats (252 mg/kg in the urban parks and 337 mg/kg in the forest). In the city, B. plumbea and L. perlatum accumulated Ag (3.18, 4.68 mg/kg), Cu (83.7, 91.0 mg/kg), and Fe (141, 125 mg/kg) in the highest concentrations. A. rubescens had the highest median Ba concentrations (1.61 and 1.20 mg/kg in the urban parks and control site). R. cyanoxantha resembled the most with A rubescens. The saprotrophic species contained appreciably higher concentrations of Ag, Cu, Fe, Mg, P, S than the mycorrhizal ones. Common feature of all five species was the higher Ag and Sr concentrations in the fruiting bodies of urban origin. This study revealed L. perlatum and S. granulatus as suitable indicator species for the urban pollution.

Keywords: Mushrooms, Environmental Pollution, Elemental Composition, Bioindicators, Urban Areas

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CONSERVATION VALUE OF PEAT BOGS FOR HABITAT SPECIALIST SPIDERS

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Abstract:

The natural oligotrophic peat bogs are one of the most specific habitat types of wetlands and they are critical for biodiversity conservation. In Eastern Carpathians (Transylvania, Romania) there are located some peat bogs of high conservation value, known as glacial refuges for rare, relict plant and animal species. Our former studies have shown that these bogs have also an important role in conservation of unique spider communities with many rare, bog specialist species.

Spiders were sampled using different methods, they were preserved in 70% ethanol-solution and the species identification was carried out with stereomicroscope using various keys. In the studied peat bogs we found high species richness, abundance and diversity. Some species were new records for the Romanian arachnofauna, moreover, the occurrence of other questionable species was proved, and some other rare, highly endangered spider species were identified. The present study definitely showed the high conservation value of natural oligotrophic peat bogs. The specialized spider species were present even in the small peat bogs, indicating the role of these bogs to conserve the specialized fauna. These bogs are ultimate habitat islands that provide refuge for these species.

Keywords: Araneae, Spiders, Small Habitat Island, Conservation

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USE OF DILUTED DRAW SOLUTION OF ANAEROBIC OSMOTIC MEMBRANE BIOREACTORS AS LIQUID FERTILIZER

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Abstract:

Recently, resource recovery has gained importance due to increased population and rapid industrialization. In this study, the use of composite diluted draw solution (DDS) of anaerobic microfiltration osmotic membrane bioreactor (AnMF-OMBR), and up-flow anaerobic sludge blanket microfiltration osmotic membrane bioreactor (UASB MF-OMBR) treated synthetic slaughterhouse wastewater as liquid fertilizer was evaluated. The DDS was diluted with tap water to provide agricultural irrigation water due to its high salinity. The suitability of agricultural irrigation was evaluated according to agricultural irrigation standards (MEU, 2010). Liquid fertilizer applications were carried out in a plastic-coated wooden flower pots at room temperature. Grass seed planted in a 26-section pot were irrigated with DDSs of both reactors and commercial fertilizers (nitrogen, phosphorus, and potassium fertilizers). At the end of the study; root length, grass height, the number of shoots, the number of fringes, grass color, plant water holding capacity, soil water holding capacity and coating rate were determined. The data were evaluated with the Analytical Hierarchy Process (AHP). It was observed that the grass irrigated with DDS of UASB MF-OMBR more improved than the grass irrigated with DDS of AnMF-OMBR in terms of the number of fringe, grass color, and coating rate. Furthermore, the grass irrigated with composite DDSs grew more than the grass irrigated with commercial fertilizers. This study showed that the DDSs of both reactors could be used as liquid fertilizer.

Keywords: Resource Recovery, Anmf-OMBR, UASB MF-OMBR, Agricultural Irrigation, Liquid Fertilizer

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PREVENTION OF MUCILAGE ON MARINE ECOSYSTEM BY WASTEWATER REFINERY APPROACH: STRUVITE RECOVERY

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Abstract:

Wastewater treatment with a passive approach has focused on removing phosphorus (P) and nitrogen (N) for many years because of their potential to cause eutrophication in water bodies. However, high amounts of N and P are found in municipal and industrial wastewater. The enormous amount of nutrients present is one of the main factors in the formation of Marine Mucilage. At the same time their nutrient content, these wastewaters offer a high potential for struvite recovery. In this study, the effects of mucilage formation which is an environmental problem, relationship the nutrient load, was investigated. To investigate this effect, physico-chemical water quality parameters such as pH, nutrients (PO43--P, NH4+-N, TP, TN), magnesium, and molecular ratios of N:P:Mg (stoichiometry) were used. The highest NH4-N and PO4-P precipitation were around 83% and 97.0%, respectively, at pH 8.7, N:P:Mg molar ratio of 1.5:1:1. Consequently, eutrophication monitoring and the need for implementing biological C, N, P-removal treatment options (struvite recovery etc.) for all wastewater discharges reaching to the inland seas is essential.

Keywords: Mucilage, Municipal Wastewater, Nutrient, Struvite

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IMPLICATIONS FOR MARINE POLLUTION IN A CHEMICAL TANKER COLLUSIONS IN THE STRAIT OF CANAKKALE (DARDANELLES)

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Abstract:

The Turkish Straits Sea Area, which is a bridge and natural waterway connecting the Black Sea and Aegean Seas, has a very important geographical status. The Straits of Istanbul (Bosphorus) and Canakkale (Dardanelle) are the great natural way and also the Marmara Sea is the main component of the area. Contrary to Istanbul, there have been no major maritime accidents in the Canakkale. However, due to the changing and developing technology, ships have large tonnages. In addition, the investments of countries in energy transportation attract attention. Thus, chemical transportation has gained importance and there has been a change and development in the elements of maritime transportation. The Strait of Canakkale is characterized by settlements on both sides. Natural waterway areas with such characteristics need to be protected. In the study, a real-time simulation analysis was carried out in order to guide how much pollution will occur in a ship accident that may occur in a determined region in the Strait of Canakkale and to prevent the pollution that will occur there.

Keywords: Turkish Straits Sea Area, Canakkale Strait(Dardanelle),Marine Pollution Simulation, Mucilage, Strategy Of Maritime Managemement

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THE INFLUENCE OF AGRICULTURAL ACTIVITIES OF CORN PLANTING ON AIRBORNE MICROPLASTICS

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Abstract:

Background and objective: The wide and intensive use of plastics makes microplastics (MPs) ubiquitous in the environment. MPs in the farmland are likely to emit into the air due to the disturbance of soils caused by agricultural activities, increasing the levels of airborne MPs. However, studies of airborne MPs remain limited. This study aims to evaluate the influences of agricultural activities on airborne MPs in the surrounding area of corn fields.

Materials and Methods: An elementary school near corn fields in Tainan, Taiwan was selected as a sampling site. Airborne MPs were collected in the outdoor environment of two classrooms during periods of crop growing, harvesting, plowing/planting Taimazai, plowing, sowing, and filling. The abundance, shape, and size of MPs were identified and quantified using fluorescence microscopy. The polymer composition of MPs was analyzed by Raman spectroscopy.

Results: The lowest MPs levels were detected in periods of crop growing and filling (<5 items/m3). The plowing period had the highest MPs abundance (62.7 items/m3), followed by the period of plowing/planting Taimazai (40.0 items/m3). The shape of fragments accounted for the majority (61-74%), followed by pellets (10-27%), film (10-14%), and fiber (<7%). Taking the crop-growing period as an example, we found that 86% of MPs were sized 10-100 µm, and small MPs (<10 µm) accounted for 11%. The polymer composition of most MPs detected during crop growing was polyethylene terephthalate (PET).

Conclusions: Agricultural activities could affect the airborne MPs in the surrounding environment of corn fields; the period of plowing/planting Taimazai and plowing have the highest MPs abundance. MPs were mainly in the shape of fragments and the composition of PET, indicating that MPs may mainly come from discarded plastic bottles. Notably, the 10% of small MPs (<10 µm) highlights the potential of inhaling MPs; the health impact needs further investigation.

Keywords: Microplastics, Farming, Agriculture, Corn, Airborne

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ANALYSIS OF BIOCLIMATIC FEATURES OF VERNACULAR ARCHITECTURE – A CASE STUDY OF VERNACULAR RESIDENTIAL BUILDINGS IN SARAJEVO

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Abstract:

The imperative of today's architects and urban planners is to identify and implement sustainable solutions that would increase the overall quality of the urban environment and people's well-being, by maintaining a natural balance and integrity. In this regard, the bioclimatic principles of vernacular architecture can serve as inspiration for designing buildings in a contemporary urban context. This approach can help to gain knowledge about the practices of vernacular architecture, and define solutions that can deal with today's urban challenges, such as urban and environmental pollution, lack of comfort, and low quality of life. This paper presents the analysis of bioclimatic features of three well-preserved vernacular residential buildings, located in Sarajevo, Bosnia and Herzegovina. The research methodology is based on the literature research, photo documentation, and field observation, regarding the presence of bioclimatic design principles, such as building form, orientation, layout, use of local building materials, topography, traditional passive strategies - sun shading, cooling and natural-induced ventilation, natural landscape, and comfortable living environment. The results of this research showed that the selected vernacular buildings fulfill most of the basic bioclimatic principles, which could be transposed into contemporary architecture, not in the context of a pure replication of an old style, but as a modern sustainable architectural design. The analysis also showed that the potentials of passive heating were not exploited in the best possible way, therefore the improvement of the building design will be a necessary step in order to be implemented in the design of sustainable architecture.

Keywords: Contemporary Architecture, Sustainability, Vernacular Architecture, Bioclimatic Features.

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PRELIMINARY SOURCE ANALYSIS OF PM2.5 AND CHEMICAL COMPONENTS IN ISTANBUL MEGACITY

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Abstract:

Seven million people die prematurely each year as a result of indoor and outdoor air pollution, according to the World Health Organization. Although there are many implications on human health, the respiratory and cardiovascular systems are primarily impacted. Even though the daily average limit for PM2.5 has been set at 25 µg/m^3, detrimental health effects have been noted at concentrations that are slightly higher than the background level of 3 to 4 µg/m^3. Particulate matter has negative effects on ecosystems and climate change in addition to harming human health. The dynamics in the physicochemical characteristics of atmospheric aerosols dictate the scope of these effects. Size, chemical composition, and mass concentration are among the physicochemical characteristics that can change quickly depending on emission sources, atmospheric reactivity, meteorology, and sinks. In this work, a comprehensive source analysis of fine particles and their chemical composition was performed and preliminary results are presented. As a first analysis, source regions were investigated with polar plots, trajectory analysis was performed with the HYSPLIT model through cluster analysis and potential source contribution function (PSCF) model, factory analysis was performed with principal component analysis, and finally, source apportionment with positive matrix factorization (PMF) model. The results show the highest concentrations associated with low wind speeds and sources near the sampling site. The PSCF model revealed the main sources around the sampling site, in addition to potential regional sources in the Black Sea, Bulgaria, and Romania. The source apportionment model showed that road traffic represented the main source of fine particles, followed by secondary inorganic aerosol, and residential heating. Studies like this should be performed continuously in various locations throughout Istanbul Megacity in order to estimate the important sources and evaluate methods to reduce air pollution.

Keywords: Black Carbon, Megacity, Nitrate, PM2.5, Sources, Sulfate

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REMOVAL OF EMERGING CONTAMINANTS BY ADVANCED OXIDATION PROCESSES

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Abstract:

The presence of emerging contaminants, such as parabens, in aquatic environments and wastewater, have been causing great concern over the past years. Parabens (ethyl-paraben (EtP), methylparaben (MeP) and propylparaben (PrP)) are characteristic emerging contaminants and used as preservatives and have the potential to bioaccumulate. Due to their wide usage, parabens have been detected in various aquatic environments at concentrations ranging from 0.001 to 305.55 μg L-1. Conventional wastewater treatment methods are not capable of removing those types of contaminants. Over the last years, Sulfate Radical-based Advanced Oxidation Processes (SR-AOPs) have received considerable interest for the removal of organic micropollutants. As parabens are commonly found in mixtures in the aquatic environment, this study investigates the efficiency of two SR-AOPs (UV-C/Persulfate and UV-C/Peroxymonosulfate) to remove EtP, MeP and PrP as a mixture in ultrapure water and wastewater. Both SR-AOPs were proved to be efficient for the degradation of parabens and high removal percentages were observed in all cases. All compounds were removed at about 50% within 5 minutes using UV-C/Peroxymonosulfate process in ultrapure water. When wastewater was used as matrix, 50% removal was achieved in about 20 to 30 minutes. The above results suggest the dependence of the removal and the complexity of the water matrix. When UV-C/Persulfate was used to remove the parabens mixture the time needed to achieve 50% removal was higher than UV-C/Peroxymonosulfate.

Keywords: Advanced Oxidation Processes; Parabens; Ethyl-Paraben; Methyl-Paraben; Propyl-Paraben

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AS A CLIMATE ADAPTATION STUDY, SEA POLLUTION ARISING FROM ACTIVITIES IN FISHERMEN'S SHELTERS AND SOLUTION PROPOSALS

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Abstract:

In Fishermen's shelters, boats and ships are not only fish unloaded, but also sorted, processed, packaged, stored and marketed. Fishery products processed in such structures are perishable products. Therefore, it is necessary to have different facilities and units in fishery coastal structures than in other structures. In fishing shelters in Samsun, fish residues and oil create a big problem in the coastal areas. The fishermen's shelters in this area were followed and samples were taken from different areas, the fact that the dissolved oxygen of the sea water drops to almost zero in peak seasons has shown how effective the ecological degradation in that region is. Active fishing shelters were determined in this region and sea water quality was monitored by taking sea samples. Dissolved oxygen, chemical oxygen demand, oil-grease, nitrogen and phosphorus analyzes were carried out in sea water in fishing shelters. From the monitoring data, it has been determined that the sea in the fishermen's shelters is adversely affected by fish residues and oil. For these purposes, physical and chemical treatment and energy conversion alternatives were evaluated in this study. With climate change, the changes in sea water quality and the increase in temperature will increase the problems of ecological life. In this study, a solution has been produced for a problem that is easy in practice but ignored, and information will be shared for its application in fishermen's shelters.

Keywords: Black Sea, Fisherman's Shelter, Marine Pollution, Fisheries Residues, Oil/Grease

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GROUND-TO-AIR HEAT EXCHANGERS (GAHE) IN REAL CONDITIONS OF CENTRAL-EASTERN EUROPE – GREEN ENERGY FOR IMPROVEMENT OF INDOOR AIR QUALITY, BUILDING SUSTAINABILITY AND REDUCTION OF THE EFFECTS OF CLIMATE CHANGES.

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Abstract:

In sustainable single-family homes, ventilation systems have to rely on energy-efficient solutions and renewable sources of energy, while maintaining thermal comfort under different weather conditions. These systems have to deliver reliable results not only in response to daily and seasonal changes in ambient temperature, but also in response to global climate change. Ground-to-air heat exchangers (GAHE) meet these requirements. In this study, the performance of an GAHE was analyzed experimentally in the Polish climate which is characterized by hot summers and cold winters. Over a period of two years, the energy efficiency of a mechanical ventilation system operating under real climatic conditions in Olsztyn. Energy consumption in a building equipped with a natural ventilation system was compared with three other scenarios: ventilation coupled with GAHE, mechanical ventilation with heat recovery and a high-efficiency heat exchanger (HE), and mechanical ventilation with heat recovery coupled with an GAHE. What is important, the suitability of this solution for preheating ventilation air in winter conditions was shown during actual operation to be particularly high. The GAHE is able to provide about 45% of the heat required for the operation of the ventilation system and about one-fifth of the total heat required in the total balance of the facility on an annual basis. Precooling realized with GAHE in summer conditions provides about three-quarters of the cooling demand for ventilation air. GAHE also makes it possible to significantly improve the microbiological quality of indoor air in the building. An GAHE is also a solution that deserves special attention in sustainable buildings. In view of the observed climatic changes, an GAHE makes it possible to efficiently reduces the energy required for the operation of the ventilation system under highly variable external conditions. Moreover, it enables climate adaptability of the building.

Keywords: Ground-To-Air Heat Exchanger; Sustainable Indoor Ventilation System; Energy-Efficient Ventilation

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THE DETECTION OF SURFACE WATER POLLUTIONS CAUSED BY HARMFUL ALGAL BLOOMS (HABS) IN ERZURUM

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Abstract:

Although it is defines as natural organic pollutant, surface water resources which are frequently exposed to Harmful Algae Blooms (HABs) due to the increasing pollution load in recent years, the increase in temperature caused by climate change and the increase in surface run-off caused by extreme rainfall as a result of climate change are faced with the risk of the increasing concentrations of algal toxins into drinking water. Although HABs have caused the problem of eutrophication in surface waters especially at hot seasons in the past decades due to the water pollution, increasing surface water temperatures with climate change cause this problem to extended periods out of season and to be permanent for a long time. In recent years, there have been many studies focusing that the areas where HABs have expanded and their frequency has increased. For this reason, studies involving the detection and monitoring of algal toxins are gaining importance in order to control harmful algae growth at the source, especially in drinking and utility water sources. In this study, surface water was used to monitor in terms of two microcystin compounds, Microcystin-LR (MC-LR) and Microcystin-RR (MC-RR), which are the main indicators of harmful algae growth in artificial ponds created for agriculture and livestock in Oltu District of Erzurum City.

Keywords: Harmful Algal Blooms, Eutrophication, Microcystins, Surface Water Pollution, Climate Change

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SPATIAL DATA ANALYSIS USING MACHINE LEARNING TREE-BASED ALGORITHMS BASED ON SELECTED CASE STUDIES

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Abstract:

Machine learning algorithms are gaining more and more popularity in various analytics fields. This is due to their precision, speed, and versatility. Using them to build models, we can analyze complex relationships, often challenging to capture in standard statistical analyses. By additionally using tools for analyzing large data sets, we can process complicated issues. The limit can only be the computational power and ingenuity of the researcher.

This paper presents three case studies using tree-based machine learning algorithms and Python data science stack tools for spatial data analysis. They concern three different issues, the first is the detection of water surface in a satellite image, the second is crop prediction, and the third is real estate valuation. Various spatial data sets were used in the research, including raster satellite images, vector data, and databases with field measurement results. All presented case studies are developed based on the results of scientific works and projects in which the author participated.

Keywords: Machine Learning, Spatial Data Analysis, Water Surface Detection, Crop Prediction, Real Estate Valuation

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TOXIC EFFECTS OF FUNGICIDES ON FRESHWATER MICROALGAE

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Abstract:

Boscalid and Fludioxonil are commonly used fungicides against fungal plant diseases in agriculture. Following their application, excessive amounts of these fungicides can be absorbed on soil particles or/and introduced in aquatic systems. The long-term accumulation of these fungicides in freshwater can have various negative effects on aquatic microorganisms. Therefore, the assessment of toxic effects of Boscalid and Fludioxonil at environmentally relevant concentrations by using sensitive biomarkers is of high interest.

Scenedesmus rubescens, a common microalgae species, is widely used as a biological model organism to evaluate the ecotoxicity of various pollutants. For the investigation of the toxic effects of Boscalid and Fludioxonil on freshwater microalgae, Scenedesmus rubescens was exposed to various environmentally relevant concentrations of the fungicides for 96 h. Both Boscalid and Fludioxonil limited the growth of Scenedesmus rubescens especially in the first 24 h of the exposure where the inhibition was 50% and it even reach 100% for the two of the studied concentrations of Fludioxonil. Fludioxonil was found to be more toxic than Boscalid. The present study provided a better understanding of the negative effects of Boscalid and Fludioxonil in microalgae at environmentally relevant concentrations. Moreover, evaluating the negative effects of Boscalid and Fludioxonil on microalgae, the importance of the proper management of the fungicides is also highlighted.

Keywords: Boscalid; Fludioxonil; Scenedesmus Rubescens; Biomarkers; Ecotoxicity

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INVESTIGATION OF THE EFFECT OF PORE SIZES ON DM FORMATION TIME, AND CLEANING FREQUENCY

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Abstract:

Dynamic membrane (DM) technology was applied for treatment of synthetic dairy wastewater. The study consisted of two step. In first step of the study, changes in DM formation time and solid removal efficiency were investigated at different operational conditions using support materials having different pore sizes (20 and 40 µm) in an external filtration unit being situated at the outlet of up flow sludge blanket reactor. During the operation, three runs were done for each studied pore sizes and physical cleaning was done two times for each pore sizes. DM formation time became shorter as the pore sizes of support layer decreased for the initial stages of the support layer usage. On the other hand, after DM formation, support layer lost its original properties and its filtration characteristics became independent of pore size. Solid removal at different pore sizes was followed with turbidity measurements. The turbidity removal efficiency was more than 92 % for all pore sizes. The initial flux was 97 and 95 L/m2h for 20 and 40 µm pore size, respectively. The flux after DM formation during operation with 20 µm pore size was slightly higher than 40 µm pore size. The cake layer resistance effect on total membrane resistance was evaluated for 40 µm pore size. It was calculated for run-3 as 2.34x 109 1/m corresponding 99.5 % of total resistance. According to these results, cake layer resistance composed most of the total resistance. Among the pore sizes tried, 20 µm was found to be optimum pore size considering DM formation time, flux, trans membrane pressure and treatment performance.

Keywords: Dynamic Membrane, Membrane Flux, Physical Cleaning, Membrane Resistance

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EFFICIENCY OF ACTIVATED CARBON OBTAINED FROM ROSEHIP MARMALADE WASTE IN REACTIVE BLUE 28 DYE ADSORPTION

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Abstract:

Activated carbon is widely used as an effective adsorbent in the removal of many different pollutants in adsorption processes due to its large surface area and high porosity. Especially in water treatments, dyes, which are one of the most common pollutants that mix with the aqueous environment as a result of various industrial activities, is encountered. In this study, the production of activated carbon as a cheap and effective adsorbent from rosehip marmalade waste, which is a natural waste, and the removal of dye from aqueous solutions with this activated carbon were investigated. Zinc chloride (ZnCl2) was used as the activation agent in the production of activated carbon. ZnCl2: rosehip marmalade waste was mixed in a mass ratio of 2:1 and kept at 90 °C for 2 hours. Then, the dried sample was treated in a nitrogen atmosphere at 600 °C at a heating rate of 5 °C/min at a flow rate of 100 mL/min for 1 hour. The sample washed with distilled water was dried and activated carbon was prepared. The prepared activated carbon was used as an adsorbent in the adsorption of Reactive Blue 28 dye. Adsorption studies were carried out at a pH range of 1-11, 50 ppm dye solution concentration, and 1 g/L adsorbent dosage. Depending on the pH, the concentration changes in the dye solutions over time were followed and the highest removal was obtained at pH 1 as 72.71% at 44 hours. Kinetic studies of the adsorption process were carried out. Pseudo-first order, pseudo-second order and intraparticle diffusion kinetic models were examined to evaluate the process in terms of kinetics. Regression coefficients (R2) for pseudo-first-order, pseudo-second-order and intra-particle diffusion models were obtained as 0.9967, 0.9713 and 0.9906, respectively. Accordingly, it was determined that the process fits the pseudo-first-order kinetic model and the intra-particle diffusion model.

Keywords: Activated Carbon, Adsorption, Reactive Blue 28, Rosehip, Waste

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INVESTIGATION OF ADSORPTION BEHAVIOR OF ACTIVATED CARBON OBTAINED FROM CHAMOMILE AND KINETIC STUDIES

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Abstract:

The use of natural materials as an adsorbent in adsorption processes stands out because of their cheapness and high performance. In the study, the adsorption behavior of chamomile, which is a short-lived plant that can grow spontaneously in many places, as an adsorbent was studied. Dried natural chamomile and phosphoric acid (H3PO4) were mixed in a 2:1 ratio by mass for H3PO4:chamomile and kept at room temperature for 24 hours. Then the mixture was dried and kept in a nitrogen atmosphere at a heating rate of 10 °C/min at a flow rate of 100 mL/min at 600 °C for 1 hour. Then, the sample was washed with sodium hydroxide (NaOH) and distilled water, respectively, and dried in an oven. The prepared activated carbon was used in the removal of crystal violet dye from aqueous solutions. Adsorption studies were followed for 300 minutes for pH 1-7 at 20 ppm dye concentration and 1 g/L adsorbent dosage. The concentration changes were followed by taking samples from the dye solutions at certain time intervals and the behavior of the processes was revealed in 300 minutes. Accordingly, at the end of 300 minutes, the highest removal percentage was obtained as 93.11% at pH 7. The behavior of the adsorption process over time was investigated by kinetic studies. Pseudo-first-order, pseudo-second-order and intra-particle diffusion kinetic models were examined and the regression coefficients (R2) of these models were determined. Accordingly, the R2 values for the pseudo-first-order, pseudo-second-order and intra-particle diffusion model were obtained as 0.969, 0.9994 and 0.9986 and 0.9936, respectively, and according to the highest R2 values, the process was found to be compatible with the pseudo-second-order kinetic model and intra-particle diffusion model. According to the results; it was determined that the activated carbon obtained with chamomile showed effective behavior in the adsorption of crystal violet dye with high removal values.

Keywords: Activated Carbon, Adsorption, Chamomile, Crystal Violet

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ACTIVATED CHARCOAL MEDIATED MICROBIAL DEGRADATION OF DICLOFENAC USING BACTERIAL PURE CULTURES

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Abstract:

Diclofenac is a non-steroidal anti-inflammatory drug, commonly detected in natural aquatic environments around the world. This persistent bio-refractory emerging contaminant often occurs in concentrations of ecological significance leading to several physiological implications in living organisms. In this study, diclofenac was degraded by bacterial pure cultures isolated from soil, following which the degradation efficiency was enhanced using activated charcoal. Four bacterial strains were isolated and studied for degradation of 10 mg/L of diclofenac in the presence of acetate for 6 days. The contaminant removal was evaluated using High Performance Liquid Chromatography (HPLC). Diclofenac degradation occurred through co-metabolism with acetate acting as a supplementary carbon source. This degradation was further augmented using 1g/L commercial activated charcoal, which increases the removal efficiency through adsorption. A control consisting of only activated charcoal was also kept to check removal through adsorption without involving bacterial degradation. The control containing activated charcoal showed a removal efficiency of 71.36% through adsorption, whereas bacterial strains A, B, C, and D exhibited removal efficiencies of 86.73%, 80.83%, 77.77%, and 86.06% respectively. On combining activated charcoal with bacterial isolates, these removal efficiencies were considerably improved to 92.34%, 86.38%, 82.6%, and 93.31% respectively. The degradation in the case of combined activated charcoal and bacterial species on day 4 exceeded the degradation in the case of bacterial degradation on day 6. This study will extend the understanding regarding the combination of two different removal methods pertaining to conventional physicochemical and biological treatment. Following the identification of bacterial species and their morphology, another study involving the interaction of activated charcoal with the surface of bacterial colonies will further help in establishing a direct synergistic relationship with the former.

Keywords: Diclofenac; Bacterial Degradation; Activated Charcoal; Nsaid

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INVESTIGATION OF THE EFFECT OF IONIC LIQUID BASED CHITOSAN ON COLOR REMOVAL FROM TEXTILE WASTEWATER

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Abstract:

Sustainable wastewater management is a significant issue to overcome water shortage problem. In this context, it is very important to manage industrial wastewater properly. The textile industry is one of the most water consuming industry and huge amount of colored toxic wastewater is produced during the production of textile products. One of the most environmentally damaging stages in textile production is dyeing process. In some studies, it is stated that textile finishing and dyeing processes cause 20% of all freshwater pollution. Various treatment methods including physicochemical, chemical, and biological techniques are used for the color removal in the textile wastewater. Adsorption is one of the most effective methods of color removal and natural biopolymers like chitosan have great attractive as eco-friendly and low-cost sorbents.

Within the scope of the study, an imidazolium based ionic liquid was synthesized and the sorbent obtained by interacting this synthesized ionic liquid with chitosan was used for the removal of Reactive Black 5 dye. Ionic liquids are known as green solvents and their applications in wastewater treatment are quite new. There are uncountable types of ionic liquids and some studies reported that 1017 type ionic liquids exist. In this study, chitosan saturated with 0.25 g 1,4-bis(3-methylimidazolium) butane di[bis(trifluoromethylsulfonyl)imide] was used as sorbent. Adsorption experiments were carried out using a batch system. Removal efficiencies were investigated at different pH (5, 6, 7, 8, and 9) and different mixing times (10, 30, 60, 90, and 120 minutes) by adding 250 mg ionic liquid-based sorbent to the wastewater sample containing dye into the beaker placed on a mixer. RES method was used for color measurements. As a result of the study, higher than 99% removal efficiencies were achieved at all operational conditions. The optimum operating conditions were determined as pH 5 and mixing time of 10 minutes.

Keywords: Adsorption, Chitosan, Color, Ionic Liquid, Sorbent, Textile

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ENVIRONMENTAL EFFECTS OF USING RENEWABLE ENERGY IN THE PRODUCTION OF RECYCLED FIBER FROM TEXTILE SCRAPS

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Abstract:

The textile industry has a large impact on the environment for reasons such as the high use of chemicals and water on production processes, the disposal of wastes generated during production by incineration or transferring them to landfills. Cotton is one of the most used fibers and cotton cultivation also have negative impact for the environment since cotton grown needs large agricultural land and the use of water and pesticides. As a result, recycling is an issue that should be given importance for reducing the environmental impact of the cotton textile industry and for a more sustainable production.

Obtaining recycled fibers from textile scraps and producing textile products from these recycled fibers is an important application in terms of sustainable textile production. In this study, it was aimed to determine the environmental effects in case of using grid electricity and solar energy in the phase of obtaining fiber from textile scraps. Within the scope of the study, environmental effects were determined by life cycle analyses approach. The required data was obtained from a recycling company in Usak. The company uses electricity in the production and the current environmental effects of the production was determined by using their operational input and output values. As a more environmentally friendly application, the use of solar energy instead of grid electricity has been evaluated as a scenario. Gabi software was used for LCA study and the results were evaluated according to the CML impact categories.

The results reveal that production with solar energy have lower impact compared to electricity. According to results, there has been about 95% reduction in global warming potential. At almost all impact categories except the categories of abiotic depletion and ozone layer depletion potential, solar energy results lower effects than electricity.

Keywords: LCA, Textile Scraps, Recycled Fiber, Sustainability

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LOW-COST PARTICULATE MATTER MONITORING DEVICE

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Abstract:

Particulate matters are major health-affecting air pollutant and the particulate matter PM2.5 is the most hazardous air pollutant among the other air pollutants. PM 2.5 can penetrate into the interior area of the lungs and can cause chronic bronchitis, lung cancer, heart disease, etc. As per World Air Quality Report 2022, the citizens of only 13 out of the 131 countries breathe air with PM 2.5 as per the guidelines of the WHO. As per the conventional method, the initial task for the measurement of PM 2.5 is to separate the samples of PM 2.5 from the ambient air. The PM 2.5 samples can be separated using Cyclone Separators where ambient air enters into a cylinder through a tangential inlet and the generated centrifugal force throws the PM 2.5 samples to the wall of the cylinder. In the Impactor technique, PM 2.5 samples can be separated by collision against a flat surface. For the measurement of the mass of the collected PM 2.5 samples, the methods are Taper Element Oscillating Microbalance (TEOM), Beta-gauge, Gravimetric method, etc. These conventional PM 2.5 measuring systems are large in size, heavy and costly. Now a day's research tendency for measuring particulate matter is based on optical properties. In this research work, the scattering property of light has been used where light is forced to deviate from a straight path due to collision with the particulate matter. When the scattered light of selective wavelength is projected to the window of a photodetector then according to the intensity of the scattered light, the output voltage of the photodetector varies and the concentration of the particulate matter PM2.5 present in the ambient air can be viewed using LCD display connected with Arduino. This PM 2.5 measuring device is small in size and low-cost device.

Keywords: Air Pollution, Arduino, Photodetector, PM2.5, Scattering Of Light.

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PERSONAL EXPOSURES OF TOLL PLAZA EMPLOYEES TO DIFFERENT AIR POLLUTANTS ON NATIONAL HIGHWAYS IN INDIA

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Abstract:

Toll plaza employees are continuously exposed to higher pollutant concentrations due to high traffic congestion at toll plazas. To estimate their personal exposures, it is necessary to characterize the pollutants at the toll plazas. The objective of this study was to measure the concentration ranges of PM2.5 (aerodynamic diameter ≤ 2.5 µm), PM10 (aerodynamic diameter ≤ 10 µm) and BC (black carbon) at in-cabin and out-cabin locations of the toll plaza on national highway and estimation of respiratory deposition doses to the toll employees during summer season. During the study, it was identified that all the pollutant concentrations were higher at in-cabin. Specifically, for PM2.5: 135 µg m-3 vs. 101 µg m-3 (in-cabin vs. out-cabin); for PM10: 187 µg m-3 vs. 160 µg m-3 and for BC: 30 µg m-3 vs. 12 µg m-3, respectively. For the in-cabin study, the highest concentration of the all pollutants (PM2.5, PM10, and BC) were observed during the evening periods (144 µg m-3; 199 µg m-3; 39 µg m-3) compared to morning periods (135 µg m-3; 184 µg m-3; 22 µg m-3) respectively. All pollutant concentrations followed the similar pattern for out-cabin study. Further, a comparison of this study was made with the previous study conducted during winter season at the same location and found out that on an average, the pollutant concentrations during winter were ~1.6 times the concentrations during the summer study. Calculation of respiratory deposition doses showed that deposition of PM2.5, PM10 and BC particles during in-cabin studies were ~1.5, ~1.3, and ~2.5 times the particles deposition during out-cabin studies, respectively. The present study shows that the toll plaza employees are prone to higher exposure levels and strict policy implementations are necessary to limit these personal exposures for their overall well being.

Keywords: Air Pollution, Vehicular Emission, PM2.5, PM10, Black Carbon, Respiratory Deposition Doses

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BACTERIAL VIABILITY AND AIR QUALITY: EXPERIMENTAL APPROACH AND RESULTS AT THE ATMOSPHERIC SIMULATION CHAMBER CHAMBRE.

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Abstract:

Bioaerosols consist of airborne particles such as microbes and debris from biological matter, present in the atmosphere. The interest in bioaerosols is increasing rapidly to broaden the knowledge of their characterization, and to understand how the bioaerosol affects environment and human health in both indoor and outdoor air. The experiments conducted inside confined artificial environments can provide valuable information on bioaerosol. At ChAMBRe (Chamber for Aerosol Modelling and Bio-aerosol Research), managed by INFN at the Physics Department of the University of Genoa, Italy, the research on bioaerosol is focused on the investigation of the airborne bacteria behavior in different atmospheric conditions (Massabò et al., AMT, 2018). Our experiments were performed with Escherichia Coli, a gram-negative strain: the experimental protocol includes bacteria cultivation, bacteria injection in the chamber, exposure to different environmental conditions, and verification of viability (Danelli et al., 2021). The bacteria survival rate is evaluated in “clean air” conditions by comparing the bacteria total concentrations (measures by WIBS-NEO counter) with the Colonies Forming Units (CFU) collected on Petri dishes by Andersen impactor.

The injected bacteria total concentration was about 0.40 cell cm-3, while the injected bacteria viable concentration was about 0.06 CFU cm-3. Since the time-trends of total and viable concentration differ significantly, as shown in Fig. 1, the resulting ratio between viable and total bacteria concentration was the observed parameter (Fig. 2). The viable-bacteria life-time turned out to be around 40 minutes.

Keywords: Bioaerosol, Bacteria, Pollution

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IMPORTANCE OF WATER SUPPLY SYSTEM FOR PUBLIC HEALTH

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Abstract:

It is well known that polluted water is dangerous to health. Pollution of fresh water ecosystems is often the cause of diseases, and therefore a multidisciplinary approach involving hydrology, engineering, urban planning and public health is necessary for a good public health outcome. It has been recognized that a water supply system is connected with the improvement of public health of the population. Can diseases such as diarrhea in isolated rural areas or malaria in Africa be prevented through good water supply management? There is an opinion that water supply management is also public health management and that it is a very good tool in reducing and controlling diseases and will definitely play a big role in the future. Protected drinking water is essential for public health. The most common microorganisms associated with waterborne diseases are: Campylobacter, Legionella, Cryptosporidium, Norovirus, E. Coli and Giardia. Legionella has been proven to be one of the most important causes of diseases associated with the water supply systems. Investing in water infrastructure is therefore investing in the safety of drinking water, which is the basis of public health, and its pollution can even lead to a potential epidemic caused by various microorganisms. The paper will present the most common diseases that can potentially be transmitted through the public water supply system, as well as the differences in the infrastructure in different parts of the world, which play a major role in public health of the population. The importance of a good water supply system and the environment in preventing diseases that are potentially spread by contaminated drinking water will be shown. Also, possible dangers of contamination of drinking water that the population uses on a daily basis will be pointed out.

Keywords: Polluted Water, Public Health, Water Supply System, Waterborne Diseases

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ENVIRONMENTAL FUNCTION OF BLACK ALDER (ALNUS GLUTINOSA (L.) GAERTN.) TREES BASED ON STRUCTURAL INDICATORS IN BOSNIA RIVER BASIN

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Abstract:

The black alder gained emphasised attention in the riparian forest studies recently, but some knowledge about black alder is still missing for Bosnia river basin in Bosnia and Herzegovina. The aim of this study was to examine structural parameters of trees on black alder sites along Bosnia riversides to clarify their environmental functions. We identified 55 black alder plots and measured structural characteristics: diameter of breast height (DBH) and tree height of group of one dominant and two neighbouring trees representing each plot. To evaluate environmental functions, structural characteristics variability and slenderness (height/diameter ratio) were examined at plot level. We considered a slenderness, in addition with black alder sites spatial distribution, as an comprihensive indicator about tree dimensions and stand stability informative for black alder evironmetal function determination. Also, we modelled slenderness depending of DBH using non-linear regression. Related to environmental conditions, it is observed that closed canopy forest stands occupy Bosnia river headwaters bellow Igman mountain in central Bosnia while smaller stands, groups of trees and tree line formations follow Bosnia riversides to the mouth of the Sava river at the north of the country. Obtained results reviled high variability of structural indicators (coefficient of variation around 30%). The plot DBH ranged from 15.4 cm to 59.2 cm with average of 36.7 cm, while plot height ranged from 10.7 m to 34.1 m with average of 18.6 m. Average slenderness was 56.8% ranged from 29.4% to 95.7%. We modelled slenderness using non-linear regression model with determination of 51.8% (R=-0.72). Regression model indicated low slenderness for sites with DBH above 25 cm and their ecological stability with constant stand structure. Obtained slenderness pointed out higher potentials for stand and site conservation and protection than for production, clarifying environmental functions of black alder in Bosnia river basin.

Keywords: Riparian Forests, Slenderness, Regression Model, Site Protection

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MODELLING INTRA-ANNUAL PHENOLOGY OF BLACK ALDER (ALNUS GLUTINOSA (L.) GAERTN.) IN CENTRAL BOSNIA USING SENTINEL-2 DATA

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Abstract:

Tree species phenology reflects as inherited potentials so environmental impact on seasonal dynamics of plant components development. For deciduous tree species, classical methodology relays on ground observation registering leaf development and changes trough vegetation season. Recently, available high-resolution satellite spectral data are used to use reflections from leaves surfaces as indicator of phenological phases. The aim of this study is to model spectral phenology of black alder trees situated in Bosnia watershed in central Bosnia. We identified 23 sample plots and registered geo-locations of group of dominant trees there. The sample plots were visited and conducted visual observations at the beginning of each month from April to November. Then we collected interpretable Sentinel S2 satellite images in vegetation season of 2022 and determined enhanced vegetation index (EVI) to determine phenology metrics. The start of EVI change appeared on the 100th day of year (DOY) followed by sharp increase in the next three weeks. Then the period with stable EVI values continued for the next three months with a tendency to fall gradually to the end of vegetation activity in November. Spectral phenology was modelled using double logistic fitting and Gu method determining: upturn date (UD), stabilisation date (SD), downturn date (DD) and recession date (RD). The goodness of fitting is evaluated by determination coefficient (R2). The intra-annual phenological dynamic of EVI modeled using GU method reviled UD on 103 DOY (March) and DD on 256 DOY (October) with the length of the growing season of 153 days. Obtained model was significant ($p<.01$) reaching R2 above 95%. Presented research could contribute to monitor black alder phenology annually to examine black alder interactions with environment and climate impacts (spectral responses to early frost, extreme temperature and precipitation, water shortage and other).

Keywords: Spectral Phenology, EVI Phenology, Phenological Phases, Dominant Trees

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THE DETECTION AND ANALYSIS OF ANTIDEPRESSANTS IN ERZURUM URBAN WASTEWATER TREATMENT PLANT

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Abstract:

It was aimed to detect and monitor the 7 target residuals compounds consisting of Mirtazepine, Citalopram, Escitalopram, Mianserin, Doxepin, Clomipramine, Opipramol belonging to the antidepressant group of pharmaceuticals, whose use has increased rapidly after the Covid-19 pandemic, in Erzurum Urban WWTP during 12 months between December 2020-November 202 post-pandemic period in this study. Since Erzurum Urban WWTP is a biological treatment plant, after the determination of the target antidepressant compounds in the samples taken from the wastewater inlet and outlet before the discharge points, their treatability in the facility was also examined. Samples were first concentrated with ethyl acetate (EtOAc) using the liquid-liquid extraction method and then it was analyzed at the µg/L level via LC-MS/MS method. Based on the analysis results, the treatment efficiency of 7 target pharmaceutical compounds in the facility was calculated. In the same period, the removal efficiencies of the plant operating parameters, consisting of conductivity, AKM, COD, BOD5, TN, taken monthly from the plant, were calculated and their relationship with the yield of the target pharmaceutical compounds was examined. Treatment efficiencies was calculated as 0.252-4.149% for Mirtazepine, 4.295-5.421% for Citalopram, 2.860-10.750% for Escitalopram, 0.019-1.049% for Doxepin, 0.091-0.963% for Clomipramine and 0.043-0.289% for Opipramol in a total 12-month monitoring period. The treatability of 7 antidepressant active substances, selected as the target compounds within the scope of the study and monitored in Erzurum Biological AAT, were defined in the range of 0-10%. In the same period, the AKM removal efficiency in the plant was 91.98%, the COD removal efficiency was 91.76%, the BOD5 removal efficiency was 91.55% and the TN removal efficiency was 75.40% on average. Considering the treatment efficiencies of the plant operating parameters over 90% and the low treatment efficiency of the target AD compounds, it has been shown that the plant operating parameters have almost no effect on the treatability of the target compounds.

Keywords: Pharmaceuticals, Wwtp, Wastewater

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