Life
below water

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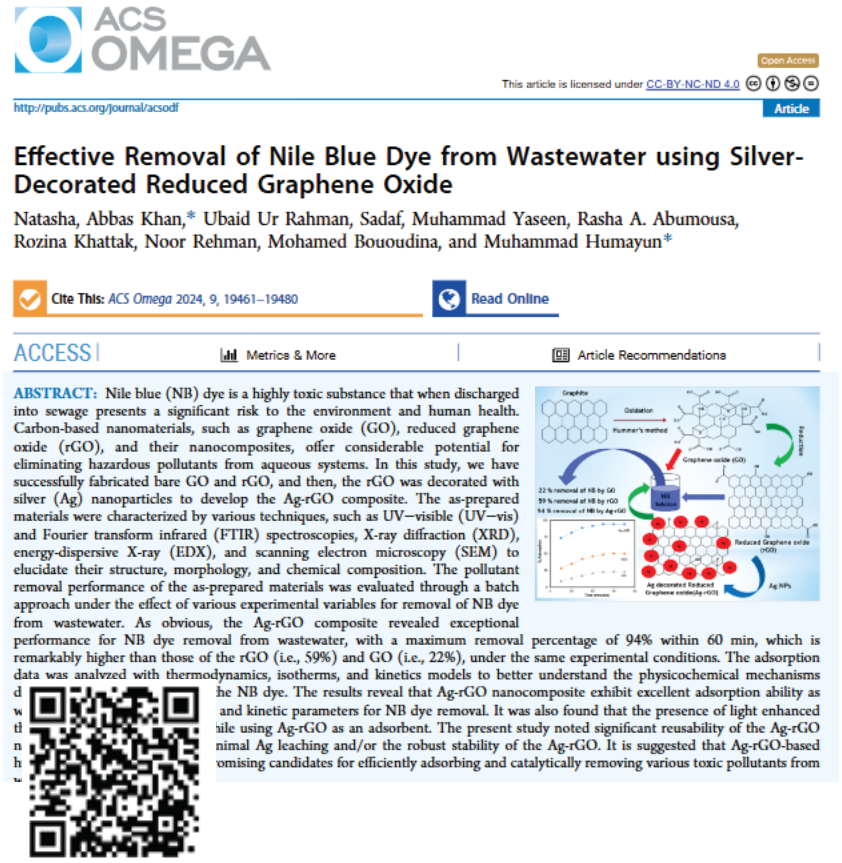
CSC

SDG 14 focuses on conserving and sustainably using the oceans, seas, and marine resources for sustainable development. PSU has contributed to and has reported on SDG 14 through various activities and initiatives.

Research and Data Collection:

Researchers at PSU have conducted research related to marine life, sustainable fisheries, ocean health, and other relevant topics and have collected data on the state of local marine ecosystems and the impact of human activities. Following are some of the published research papers from PSU authors on SDG 14.



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Article

Effective Removal of Nile Blue Dye from Wastewater using Silver-Decorated Reduced Graphene Oxide

Natasha, Abbas Khan,* Ubaid Ur Rahman, Sadaf, Muhammad Yaseen, Rasha A. Abumousa, Rozina Khattak, Noor Rehman, Mohamed Bououdina, and Muhammad Humayun*

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ABSTRACT: Nile blue (NB) dye is a highly toxic substance that when discharged into sewage presents a significant risk to the environment and human health. Carbon-based nanomaterials, such as graphene oxide (GO), reduced graphene oxide (rGO), and their nanocomposites, offer considerable potential for eliminating hazardous pollutants from aqueous systems. In this study, we have successfully fabricated bare GO and rGO, and then, the rGO was decorated with silver (Ag) nanoparticles to develop the Ag-rGO composite. The as-prepared materials were characterized by various techniques, such as UV−visible (UV−vis) and Fourier transform infrared (FTIR) spectroscopies, X-ray diffraction (XRD), energy-dispersive X-ray (EDX), and scanning electron microscopy (SEM) to elucidate their structure, morphology, and chemical composition. The pollutant removal performance of the as-prepared materials was evaluated through a batch approach under the effect of various experimental variables for removal of NB dye from wastewater. As obvious, the Ag-rGO composite revealed exceptional performance for NB dye removal from wastewater, with a maximum removal percentage of 94% within 60 min, which is remarkably higher than those of the rGO (i.e., 59%) and GO (i.e., 22%), under the same experimental conditions. The adsorption data was analyzed with thermodynamics, isotherms, and kinetics models to better understand the physicochemical mechanisms d he NB dye. The results reveal that Ag-rGO nanocomposite exhibit excellent adsorption ability as and kinetic parameters for NB dye removal. It was also found that the presence of light enhanced hile using Ag-rGO as an adsorbent. The present study noted significant reusability of the Ag-rGO nimal Ag leaching and/or the robust stability of the Ag-rGO. It is suggested that Ag-rGO-based omising candidates for efficiently adsorbing and catalytically removing various toxic pollutants from

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Aquatic Toxicology

Volume 261, August 2023, 106620

Impact of pathogenic bacterial communities present in wastewater on aquatic organisms: Application of nanomaterials for the removal of these pathogens

Gamze Yesilay [a b], Otávio Augusto L. dos Santos [c], Bevin Roger A [d], Layla J. Hazeem [e], Bianca Pizzorno Backx [f], Judith Vijaya J [d], Ayman H. Kamel [g h], Mohamed Bououdina [i]

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Novel magnetite/persulphate/ozone hybrid system for catalytic degradation/ozonation of sunset yellow dye from wastewater

Wali Muhammad[a], Sajjad Hussain[b], Abbas Khan[a,c], Hammad Khan[b], Nadeem Khan[a], Saad Ullah Khan[b], Sajjad Ali[a], Mohamed Bououdina[d] and Muhammad Humayun[a]

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ABSTRACT

Food dyes with a diverse set of colorants stimulate appetite and enhance aesthetic charm of food on table but at the same time these dyes contaminate the aquatic and biological eco-systems due to their cytotoxic and carcinogenic potentials. Herein, we report magnetite cat-alyzed removal of sunset yellow dye from water through catalytic degradation and ozonation. The magnetite catalyst revealed about 83% catalytic degradation and 92% cata-lytic ozonation performance toward sunset yellow dye at 180 and 25 min, respectively. Furthermore, the persulphate/magnetite/O_3 hybrid system revealed superior performance compared to the persulphate/magnetite under identical conditions. Kinetic studies revealed that the dye degradation data followed second-order kinetics, suggesting that the dye removal process is physicochemical in nature. This study further demonstrates that the per-sulfate/magnetite/O_3 hybrid system can efficiently decompose sunset yellow dye in aqueous solution compared to the Fenton's reagent and simple catalytic decomposition processes which is attributed to its unique structural features.

ARTICLE HISTORY

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KEYWORDS

Catalysis; degradation; Fenton; kinetics; ozonation; persulphate; second order; sunset yellow dye

SUSTAINABLE DEVELOPMENT GOALS

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Fabrication and characterization of CuO–SiO_2/PVA polymer nanocomposite for effective wastewater treatment and prospective biological applications

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ABSTRACT

The quality of water significantly affects the health and walefare of all orginisms, highlighting the importance to develop low-cost and efficient wastewater treatment methods. Herein, we report the fabrication, characterization, and utilization of a polymer-based ternary nanocomposite (CuO–SiO_2/PVA) for the removal of Nile Blue (NB) and Methylene Blue (MB) contaminants from wastewater, along with exploring its potential biological activities. We have successfully employed the cost-effective sol-gel and in-situ polymerization approaches to fabricate the CuO–SiO_2/PVA based ternary composite, utilizing $Cu(NO_3)_2{\cdot}3H_2O$:Glycerol:TEOS:PVA in a ratio of 8:2:3:4. The desired fabrication of nanocomposite was confirmed through UV-Visible spectroscopy, SEM (scanning electron microscope), TEM (transmission electron microscope), EDX (energy dispersive X-ray diffraction), FTIR (Fourier transform infrared), DSC (differential scanning calorimetry), and TGA (thermogravimetric analysis). In addition to its biological potentialthe performance of the nanocomposite in catalytic / photocatalytic removal of NB and MB dyes is investigated and compared. The higher photodegradation performance of the composite for NB (85%) dye than for MB (76%) dye indicates that variables such as chemical structure, charge, molecular mass, and pH sensitivity of the dyes can influence the catalyst's removal potential. This composite is considered to have a higher capability for removing pollutants and microorganisms from wastewater.

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KEYWORDS
CuO–SiO_2/PVA; catalysis; photocatalysis; antioxidant and antileishmanial activity

ELSEVIER

Process Safety and Environmental Protection
Volume 184, April 2024, Pages 1525-1539

Developing and optimizing a new cogeneration cycle to produce hydrogen from seawater

Tao Hai [a b c], Vishal Goyal [d], Saman Aminian [e], Hamad Almujibah [f], Ta Van Thuong [g], Naglaa F. Soliman [h], Walid El-Shafai [i j]

ELSEVIER

Energy
Volume 294, 1 May 2024, 130627

Tri-objective optimization of electricity, fresh water, and hydrogen production in a biomass-driven trigeneration plant: Thermoeconomic and environmental evaluation

Tao Hai [a b c], Rishabh Chaturvedi [d], Riyam K. Marjan [e], Hamad Almujibah [f], Ta Van Thuong [g], Naglaa F. Soliman [h], Walid El-Shafai [i j]

SUSTAINABLE DEVELOPMENT GOALS

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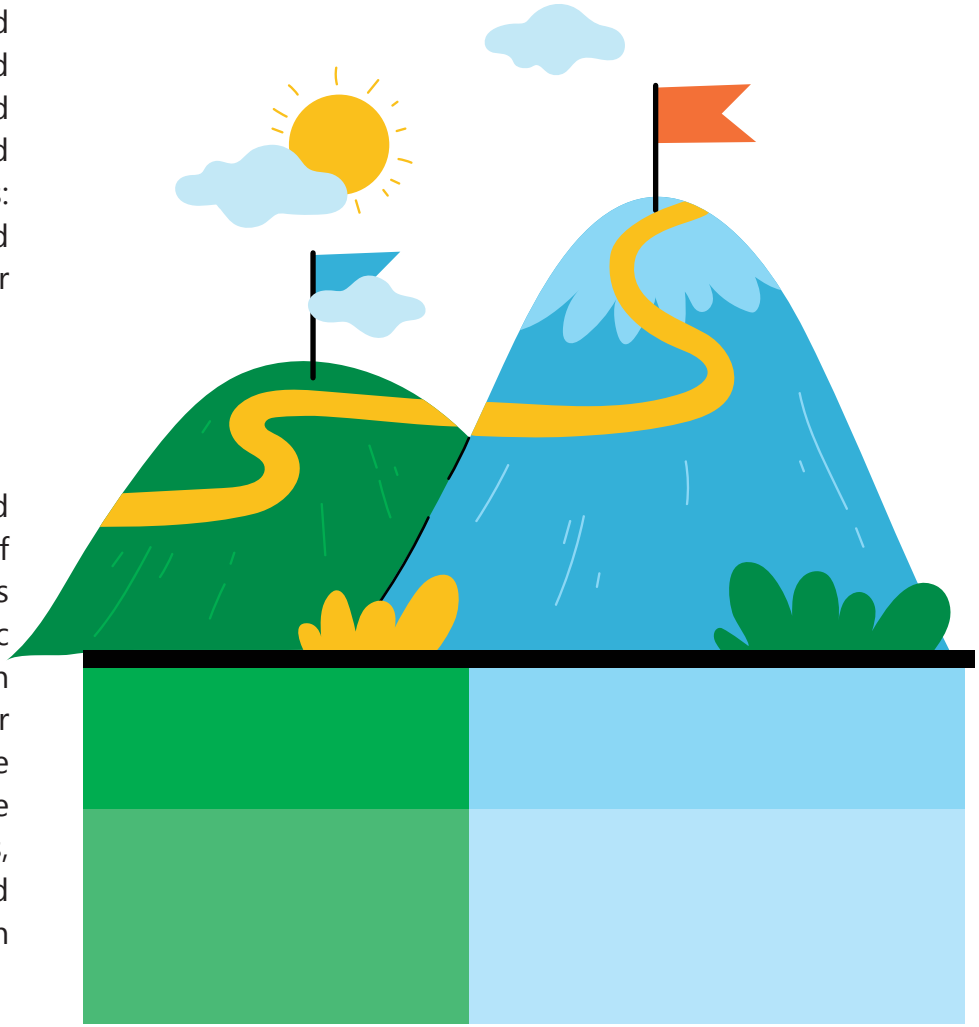
Educational Programs

Following are a few of the educational programs related to environmental conservation and sustainable management of water.

CEE 447 Groundwater Engineering

Credits: 3 (3,0,0) Prerequisite: CEE 341

Fundamental science of hydrogeology, the study of the distribution and movement of water through geologic formations, i.e. soil, sediments, and rocks. The mathematical models of fluid flow in porous media and methods for solving these equations (e.g., analytical, numerical, and statistical approaches). Practical groundwater engineering problems: characterizing the subsurface using aquifer tests, transport and remediation of contaminants, and innovations in groundwater management, as time permits.



CEE 442 Environmental Management

Credits: 3 (3,0,0) Prerequisite: Senior Level Standing

This course surveys the scientific principles of environmental issues and environmental management practices, with attention to the health of both humans and the ecosystem. Fundamental and emerging topics related to air and water pollution, water use and management, aquatic ecosystems, energy and climate change, biodiversity, toxic substances in the environment, solid waste management, and regulatory strategies for risk assessment and environmental management are examined. The course will critically examine contemporary thinking on these environmental themes including: sustainable use practices, political-ecology, decentralized environmental management, and community-based approaches, social learning, and regional and urban planning.

PSU's commitment to SDG 2030

Mission

PSU is committed to United Nations Sustainable Development Goals (SDGs) through effective institutional resource management, innovative teaching and learning, research, national and international partnerships, continuous studies, and outreach. PSU shall undertake the following activities: form higher and steering committees, evaluate each SDG, formulate and develop related SDG policies, conduct awareness campaigns to the PSU community, establish a sustainability office, identify the SDGs related to each college, program, and course, and lab centers at PSU, and implement sustainability-related initiatives.

Vision

Prince Sultan University strives to support Saudi Arabia's Vision 2030 and the United Nations Sustainable Development Goals (SDGs) by paving the way for higher education in KSA and Middle East.

Mission

Supporting the Saudi Arabia's Vision 2030 and the PSU's strategic directions, PSU aligns its mission with SDGs by providing quality education, sustainability initiatives, lifelong learning, scientific research, and community service

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