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CHEMICAL EFFECTS

Targeted stepwise pre-adsorption for enhanced nanofiltration removal of dissolved organic pollutants in petrochemical wastewater

2025-08-13

Membrane fouling caused by multi-component organic chemicals poses a serious challenge in petrochemical wastewater treatment, but targeted pre-adsorption holds promise for enhancing nanofiltration performance. In this study, targeted stepwise pre-adsorption for removing key pollutants, including N,N-dimethylformamide (DMF), fluorescent dissolved organic matter (FDOM), aromatic compounds, alkanes and other components, from petrochemical wastewater was investigated. Special emphasis was placed on elucidating the underlying mechanisms for enhancing nanofiltration performance and reducing membrane fouling. The results demonstrated that targeted two-step adsorption combining coal activated carbon and aluminum silica gel overcame the limitations of single adsorption and enhanced the nanofiltration performance, achieving 95.4% DOC removal and 92.7% biotoxicity reduction. Two-step pre-adsorption reduced membrane fouling by 89.4% and maintained stable nanofiltration performance over five cycles. Mechanistic analysis revealed that the surface cake layer contributes 56% of the increased resistance, primarily mitigated by removing colloidal fractions (e.g., FDOM). Additionally, removing hydrophobic fractions (e.g., aromatic compounds and alkanes) effectively alleviates membrane pore blockage. The targeted stepwise adsorption extended the service life of the nanofiltration membranes, reduced operating costs by 75% and decreased carbon emissions by 13.8%. This study elucidates the mechanism by which targeted removal of multi-component pollutants enhances nanofiltration purification of petrochemical wastewater, offering a feasible option for long-term, cost-effective, deep treatment of complex wastewater.

Authors: Jinming Lei, Ruifang Qi, Yu Yang, Chenghong Feng

Full Source: Water research 2025 Aug 13;287(Pt A):124390. doi: 10.1016/j.watres.2025.124390.

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The potential of decision tree application in threshold analysis of hazardous volatile organic compound release from biochar: Implications for environmental risk assessment

2025-08-14

The release of hazardous volatile organic compounds (HVOCs) from biochar poses a potential threat to both human health and the environment. This study investigates how low pyrolysis temperature (HTT) and the chemical characteristics of lignocellulosic biomass, expressed as the carbon-relative molar mass (CRMM) index (g·mol-1), influence the release of hazardous volatile compounds from biochar. A total of 204 biochar samples were produced from pure biomass components: lignin (L), cellulose (C), hemicellulose (H) and their mixtures, and analyzed using stepwise multiple regression, agglomerative hierarchical clustering, principal component analysis (PCA), and regression decision trees. The analysis included both qualitative and quantitative assessments of HVOCs. Qualitative results indicated the presence of HVOCs, but quantitative patterns were nonlinear and inconsistent with expected trends. Decision tree analysis showed that the highest release occurred either at very high CRMM values (>34 g mol-1) or at low-temperature conditions (200-325 °C) with low CRMM. The lowest release was associated with temperatures 350-425 °C and elevated CRMM. The results emphasize the need to consider both process and substrate parameters when assessing release risks, providing a new approach to evaluating the safety of biochar in the context of environmental and human health protection. To our knowledge, this is the first study to apply decision tree regression to model HVOC release from biochar based on CRMM and pyrolysis conditions.

Authors: Ewa Syguła, Kamila Piasecka, Jacek Łyczko, Andrzej Białowiec

Full Source: The Science of the total environment 2025 Aug 14:998:180252. doi: 10.1016/j.scitotenv.2025.180252.

Enclosure walls enhanced soil organic carbon storage in sloping croplands of the Yi ethnic minority region: evidence from the Anning River Basin (SW China)

2025-08-15

The accumulation and decomposition of soil carbon pools directly influence the global terrestrial ecosystems' carbon balance. In contrast, the loss of soil organic carbon (SOC) and dissolved organic carbon (DOC) poses a serious threat to the sustainable management of sloping

croplands. As a traditional agricultural landscape and distinctive soil and water conservation measure in the Yi ethnic minority region of Southwest China, Enclosure walls (EWs) exhibit an unclear capacity for carbon sequestration. This study uses the Anning River Basin as a case to elucidate the intercepting effects and driving mechanisms of EWs on SOC and DOC in sloping croplands. By combining field sampling with multivariate analysis methods such as Random Forest (RF) and partial least squares path modeling (PLS-PM), the results show that: SOC and DOC contents increase significantly downslope; compared to upslope position, SOC content in the surface layer (0-10 cm), middle layer (10-20 cm), and bottom layer (20-40 cm) of the soil at downslope position increased by 23.98 %, 65.07 %, and 127.9 %, respectively, while DOC content increased by 36.39 %, 84.21 %, and 111.54 %, respectively. Along the profile direction, SOC and DOC content decreased with increasing soil depth; however, at the downslope position, the presence of EWs resulted in no significant differences in SOC content across different soil layers. Additionally, we compared SOC and DOC content in sloping croplands with EWs and without EWs, thereby demonstrating the carbon sequestration effect of EWs. RF and PLS-PM identified the key drivers of SOC and DOC, including soil chemical indicators such as total nitrogen, alkaline hydrolysable nitrogen, C: N ratios, total phosphorus, and C: P ratios. EWs enhance the carbon sink potential of sloping croplands through the 'erosion interception-structural reconstruction-synergistic feedback' mechanism. This study provides a scientific basis for advancing soil and water conservation and carbon neutrality goals in mountainous areas.

Authors: Qianjun Zhao, Hui Liu, Jun Luo, Shaojun Tan, Hongkai Chen, Xinxiao Yu, Yuan Su, Lei Wang, Fengjie Fan, Ziquan Zuo, Bin Zhang

Full Source: Journal of environmental management 2025 Aug 15:393:126954. doi: 10.1016/j.jenvman.2025.126954.

ENVIRONMENTAL RESEARCH

Environmental impacts of chemically recycling flame retardant cotton textile

2025-08-17

Vast environmental impacts from the textile sector have created needs for various circularity practices like sustainable recycling. However, one of the main causes hindering efficient recycling of textile waste is the presence of chemical residues as they are often unwanted in the recycled material and removing them requires additional treatment. One example of a challenging textile waste flow is workwear that is impregnated with

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sturdy chemical finishes. In this article, we study how a flame retardant chemical finish in workwear affects the environmental efficiency of recycling. Through life cycle assessment, we evaluate the environmental impacts of chemically recycling the textile in scenarios where the chemical is either retained or removed from the material. These recycling scenarios are compared against a scenario of energy recovery through textile waste incineration. According to the results, the removal scenario causes the highest environmental burden, even surpassing the impacts of energy recovery. Recycling the material without chemical removal is the preferred option from an environmental viewpoint. However, due to technology immaturity and speculative substitution assumptions, the uncertainty of the results is high. The results demonstrate the importance of assessing recycling impacts before adoption and highlight the need for designing the products with less permanent chemicals. They also underline the potential of closed loop recycling, which, however, can be challenging to implement in practice.

Authors: Kiia Silvennoinen, Helena Dahlbo, Inge Schlapp-Hackl, Susanna Horn

Full Source: Waste management & research: the journal of the International Solid Wastes and Public Cleansing Association, ISWA 2025 Aug 17:734242X251353111. doi: 10.1177/0734242X251353111.

Microplastics in the environment: The role of polymer science

2025-08-15

In this paper we highlight some fundamental aspects regarding the role of polymer science in the behavior of microplastics (MP) and in understanding the effects of MP on the environment and on the health of humans and other living species. We stress that MP is not just another type of microparticle that affects our environment. Instead, MP has polymer-specific interactions with the environment and living species, which cannot be fully understood without polymer science. We emphasize here the most important areas (nomenclature and terminology; MP's identification and characterization; fragmentation mechanism; environmental fate and transport; risk assessment; remediation; and alternative solutions) for the plastic waste and microplastics problem,

which can be solved only through the combined efforts of all experts, including polymer scientists.
Authors: Sergey V Lyulin, Andrey A Gurtovenko, Francesco Saliu, Paolo Galli, Dinesh Surroop, Aleksander A Yaroslavov, Svetlana G Radionova, Tatiana A Kuznetsova, Jose M Kenny
Full Source: The Science of the total environment 2025 Aug 15:998:180267. doi: 10.1016/j.scitotenv.2025.180267.

PHARMACEUTICAL/TOXICOLOGY

A Comparative Trial of Occupational Therapy Using Ayres Sensory Integration and Applied Behavior Analysis Interventions for Autistic Children

2025-08-15
Many autistic children demonstrate sensory integration differences that impact their participation in daily living activities and tasks. Occupational Therapy using Ayres Sensory Integration (OT-ASI) is an evidence-based intervention for autistic children that addresses the sensory integrative factors impacting daily living skills and participation in a variety of tasks and activities. Applied Behavior Analysis (ABA) is the recommended evidence-based practice for autism to improve a range of developmental domains. This study compared Occupational Therapy using Ayres Sensory Integration, Applied Behavior Analysis, and no treatment on daily living skills and individualized goals for autistic children who also show sensory differences. A parallel arm comparative effectiveness trial design with participants randomized equally to OT-ASI, ABA, or no treatment. Intervention consisted of 30 one-hour sessions. Significant gains in individualized goals, measured by Goal Attainment Scaling, were found in both treatment arms over the no treatment group. Both the OT-ASI and the ABA groups improved in daily living skills measured on the Pediatric Evaluation of Disabilities Inventory; although the improvements over the no treatment group were not significant. Both OT-ASI and ABA improved individualized goals and daily living skills at comparable levels. These findings are discussed in light of their implications for intervention. Trial Registration: NCT02536365.
Authors: Roseann C Schaaf, Elizabeth M Ridgway, Emily A Jones, Rachel L Dumont, John Foxe, Tim Conly, Catherine Sancimino, Misung Yi, Zoe Mailloux, Joanne M Hunt, Leon Kirschner, Ben E Leiby, Sophie Molholm
Full Source: Autism research : official journal of the International Society for Autism Research 2025 Aug 15. doi: 10.1002/aur.70099.

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Optical correction of hyperopia in school-aged children: a scoping review protocol

2025-08-17
Introduction: Prescribing patterns for hyperopia in children vary widely among eye care providers worldwide. This scoping review aims to identify and map the current literature on optical correction and catalogue outcomes reported, particularly in the domains of vision, vision-related functional outcomes and quality of life (QoL) in school-aged children with hyperopia.
Methods and analysis: This protocol was developed in accordance with the Joanna Briggs Institute's Manual for Evidence Synthesis. We will include studies involving school-aged children with hyperopia without restrictions on sex, gender, race, ethnicity, type of optical correction, length of intervention, publication date or country of origin. We will include studies with internal or external comparison groups. We will exclude studies associated with myopia control treatments, ocular and visual pathway pathologies affecting vision or visual function. We will search Cochrane CENTRAL, Embase.com and PubMed. Examples of data to be extracted include population demographics, visual acuity, study-specific definitions for refractive error, treatment regimens for optical correction, vision and vision-related functional outcomes and QoL (general or vision-related) as quantified by validated instruments.
Ethics and dissemination: Informed consent and Institutional Review Board approval will not be required, as this scoping review will only use published data. The results from the scoping review will be disseminated by publication in a peer-reviewed scientific journal and at professional conferences.
Authors: Gayathri Srinivasan, Kristen L Kerber, Su-Hsun Liu, Vivian M Manh, Kristine Huang, Alexandra Williamson, Soumen Sadhu, Morgan C Ollinger, Zahra Tajbakhsh, Jennifer H Fisher, Nathan L Cheung, Jasmine Junge, Kevin C H Chan, Jameel Rizwana Hussaindeen, Patrick Simard, Kelsey R Trast, Christina E Morettin, Samantha Krueger, Augustine N Nti, Debora M Lee Chen, Tawna L Roberts
Full Source: BMJ open 2025 Aug 17;15(8):e103546. doi: 10.1136/bmjopen-2025-103546.

Phthalate and Nonphthalate Plasticizer Exposure among Children of Korea, Thailand, Indonesia, and Bangladesh: Occurrences and Risk Comparison

2025-08-15

Children are considered vulnerable to plasticizer exposure and related adverse health effects. In many Asian countries, however, the extent of plasticizer exposure among children is poorly understood despite the increasing use of plasticizers. This study compared plasticizer exposure levels and risks among children in four Asian countries and investigated the major risk drivers. Children aged 6-14 years old were recruited between 2022 and 2023 from Korea (n = 89), Thailand (n = 111), Indonesia (n = 100), and Bangladesh (n = 100). They were measured for major metabolites of phthalates and nonphthalate plasticizers in the first morning void urine. Indonesian and Bangladeshi children showed higher exposure to phthalates but lower exposure to nonphthalate alternatives. At the same time, children from Thailand and Korea exhibited a greater transition to the alternatives. In all countries, DEHA contributed to over 80% of the total estimated daily intake (EDI) for all plasticizers. Bangladeshi children exhibited 1.5-2 times greater total plasticizer exposure than the children of the other countries across all EDI quartiles. Among the high-risk subgroup (within the top 25th percentile of the hazard index), DEHP accounted for 62 and 52% of the cumulative risk in Indonesia and Bangladesh, while DnBP contributed to 63 and 54% in Thailand and Korea, respectively. Our observations reveal critical disparities in plasticizer exposure among Asian children, highlighting an urgent need for follow-up investigations on the exposure sources of major risk drivers and region-specific interventions.

Authors: Joeun Jung, Ah-Reum Jo, Yuna Kim, Eun-Ah Park, Jin-Yeong Heo, Na-Youn Park, Sonja A Wrobel, Holger M Koch, Jeongim Park, Aram Lee, Kraichat Tantrakarnapa, Wissanupong Kliengchuay, Sarima Niampradit, Ramadhan Tosepu, Ani Umar, Khaled Hossain, Osman Goni, Hyunwoong Park, Younglim Kho, Kyungho Choi

Full Source: Environmental science & technology 2025 Aug 15. doi: 10.1021/acs.est.5c04600.

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OCCUPATIONAL

Association between serum metal levels and NLRP3 gene polymorphisms with cognitive function in aluminum workers: A combined epidemiological and genetic study

2025-08-12

Background: Metals, genes, and cognitive function are closely related. This study evaluated serum metal levels, NLRP3 gene polymorphisms, and their association with cognitive function in aluminum workers.

Methods: A cross-sectional survey was conducted with 478 aluminum workers. Serum metal levels were measured using Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and cognitive function was assessed using the Montreal Cognitive Assessment (MoCA) scale. Generalized Linear Models (GLM), Least absolute shrinkage and selection operator (Lasso) regression, Bayesian Kernel Machine Regression (BKMR), and Weighted Quantile Sum (WQS) were used to analyze the relationship between metal exposure, cognitive function, and the interaction with NLRP3 gene polymorphisms.

Results: Zinc (Zn) levels were positively associated with MoCA scores (β= 4.73, 95 % CI: 0.54, 8.92). A metal mixture (Na, Zn, Co, Mo, Ti, Sr, Ba) below the 60th percentile also showed a positive correlation with MoCA scores. The NLRP3 rs3806265C/C and rs4612666C/T and T/T genotypes were negatively associated with MoCA scores (β= -0.91, 95 % CI: -1.64, -0.17; β= -0.61, 95 % CI: -1.19, -0.02; β= -0.86, 95 % CI: -1.62, -0.10). In individuals with the C/T genotype of rs3806265 and rs4612666, Zn was positively associated with MoCA scores (β= 5.99, 95 % CI: 0.60, 11.38; β= 6.46, 95 % CI: 0.80, 12.12).

Conclusion: Decreased serum Zn levels may increase cognitive dysfunction risk. Individuals carrying the NLRP3 rs3806265C/C and rs4612666C/T or T/T more susceptible to cognitive decline. Individuals carrying the rs3806265C/T and rs4612666C/T genotypes are more likely to cause cognitive decline in the presence of Zn deficiency.

Authors: Youxing Li, Wenxue Li, Yaqin Pang, Yufang Cen, Rongqing Xiao, Yinxia Lin, Boya Li, Jingyi Lu, Yincai Lan, Ahmad Razali Bin Ishak, Guangzi Qi, Mohd Shukri Bin Mohd Aris

Full Source: Journal of trace elements in medicine and biology: organ of the Society for Minerals and Trace Elements (GMS) 2025 Aug 12:91:127712. doi: 10.1016/j.jtemb.2025.127712.

Identification of individuals at higher risk of airway obstruction among workers in swine operations using polygenic risk scores

2025-08-16

Prior studies have investigated individual single nucleotide polymorphisms (SNPs) as risk factors for the development of lung disease in swine operation workers. The aim of this study was to determine the collective effects of multiple SNPs and a polygenic risk score (PRS) in swine operation workers and identify workers at a higher risk of airway disease. This study included 374 full-time swine operation workers and 411 non-farming rural residents. Least absolute shrinkage and selection operator (LASSO) with 10-fold cross-validation was used to identify SNPs, which were used to calculate a PRS score for airway obstruction. Decision tree was applied to dichotomize the PRS score into two genetic susceptible groups (high vs. low). Logistic regression was employed to examine the association between dichotomous PRS score and airway obstruction. All workers were divided into two PRS genetic susceptible groups (high vs. low) by a cutoff value of 4.196. Logistic regression showed that workers in the high PRS group were 5.5-fold more likely to be associated with airway obstruction compared to workers in the low PRS group after controlling for potential confounders. A PRS score was identified as a useful tool in identifying workers at increased risk of airway obstruction in swine operations.

Authors: Liam Robbins, Ambikaipakan Senthilselvan, James Dosman, Jeremy Beach, Donna Rennie, Zhiwei Gao

Full Source: Journal of toxicology and environmental health. Part A 2025 Aug 16:1-12. doi: 10.1080/15287394.2025.2545425.