frontiers | Frontiers in Environmental Chemistry

TYPE Editorial
PUBLISHED 03 June 2025
DOI 10.3389/fenvc.2025.1625025

OPEN ACCESS

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RECEIVED 08 May 2025
ACCEPTED 19 May 2025
PUBLISHED 03 June 2025

CITATION
Hao L, Hu Q, Ma H and Shimizu K (2025) Editorial: Resource recovery, waste conversion, pollutants remediation and carbon neutralization.
Front. Environ. Chem. 6:1625025.
doi: 10.3389/fenvc.2025.1625025

Editorial: Resource recovery, waste conversion, pollutants remediation and carbon neutralization

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KEYWORDS

recovery, conversion, pollutant, remediation, carbon neutralization

Editorial on the Research Topic
Resource recovery, waste conversion, pollutants remediation and carbon neutralization

In the face of global environmental changes and their threats to human health, environmental pollution control and resource recycling have become urgent issues (Tong et al., 2022; Ahmad et al., 2022). Growing concerns about environmental pollution have led researchers and practitioners to seek innovative solutions for pollutant mitigation to address pressing environmental challenges. This Research Topic entitled "Resource Recovery, Waste Conversion, Pollutant Remediation and Carbon Neutralization," focuses on: 1) Occurrences, characteristics, transport, conversion, and risks of contaminants such as heavy metals, antibiotics, and microplastics; 2) Sustainable and eco-friendly techniques and applications, especially with the use of natural, recovered, or waste materials for remediation; 3) Chemical species studies of contaminants in water, soil, and sediment, as well as interaction with environmental factors.

This Research Topic offers a platform for researchers to exchange ideas and share findings, promoting the development of environmental science and technology. It contains four articles in total, including one paper review and three original research articles. These articles not only present the latest research findings but also offer directions and insights for future studies.

The increasing levels of antibiotics in water threaten ecosystems and human health (Barathe et al., 2024). The study by Aziz et al. investigated the potential of removing antibiotics (azithromycin, ciprofloxacin, and their mixtures) was explored from aqueous solutions by using iron-loaded biochar synthesized from pine cones. The biochar was synthesized through pyrolysis and modified with iron salts. Maximum removal performance of 87.8% (azithromycin), 91.3% (ciprofloxacin) and 84% (mixtures) were achieved in the study. Results indicated that the conversion of pine cones into Fe-modified biochar was a valuable strategy for waste reduction as an adsorbent, offering a promising way for both water and pollution remediation.

Moreover, photocatalytic technology has become a research hotspot for dealing with antibiotic contamination due to its high degradation efficiency, recyclability, and minimal

secondary pollution (Song et al., 2023). Gan et al. developed a flower-shaped Z-scheme ZnO/ZIS heterostructure that could efficiently photodegrade antibiotics. This study provided new information concerning the mechanism of sulfamethoxazole degradation through the ZnO/ZIS photocatalytic system and elucidated the process of formation and the effects of PFRs during the process.

In the view of the pervasive presence of per and polyfluoroalkyl substances (PFAS) on a global scale, concerns have been raised that land application of sewage sludge and biosolids may serve as a conduit for the entry of PFAS into the food chain. The review by Saliu and Sauvé assessed the global sewage sludge/biosolids generation, the diverse treatment methodologies employed, and the contamination prevalence of PFAS. The factors influencing PFAS contamination in sewage sludge/biosolids were also evaluated with the existing PFAS regulations or recommendations for land application compiled.

Sustainable and renewable energy has been rummaged all over the world (Fu et al., 2021). Anaerobic digestion of waste-activated sludge was one of promising sustainable and environmentally friendly energy production way. A pretreatment strategy to waste-activated sludge can enhance its bio-degradation and biogas yield. In the study conducted by Almegbl et al., synergic effect of thermo-chemical pretreatment of waste-activated sludge on bio-methane enhancement was investigated. Results suggested that alkaline and microwave pretreatments could substantially boost bio-methane production, offering practical guidance for combining energy generation with pollution control.

Overall, we hope this Research Topic will inspire further interdisciplinary research and cooperation, providing valuable insights and references for researchers in related fields, and advancing environmental remediation technologies toward new discovery and applications. We are grateful to all authors, reviewers, and editorial staff for their dedication and contributions to the successful publication of this Research Topic.

Author contributions

LH: Writing – original draft. QH: Writing – original draft. HM: Writing – review and editing. KS: Writing – review and editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. Financial support has been received from the Key R&D Program of Xinjiang Uygur Autonomous Region (2022B02021), Ordos Science and Technology Major Project (ZD20232319), the R&D Program of Beijing Municipal Education Commission (No. KM202210016006), Young Elite Scientists Sponsorship Program by BAST (No. BYESS2023129), BUCEA Pyramid Talent Training Project (No. JDYC20220816) and Open Research Fund Program of Key Laboratory of Urban Stormwater System and Water Environment (Beijing University of Civil Engineering and Architecture), Ministry of Education.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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Publisher's note

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