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Editorial on carbon capture

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Editorial

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Carbon capture is a critical strategy in the global response to climate change, offering a powerful means to reduce atmospheric CO_2 levels and curb global warming. In 2023, fossil fuels accounted for over 70% of the world's energy supply, contributing to emissions of approximately 37 billion tons of CO_2.[1] This stark figure contrasts sharply with the current global carbon capture and storage capacity of just 0.04 billion tons per year,[2] highlighting an urgent need to develop more efficient, reliable and scalable carbon capture solutions.

Although established techniques, such as amine-based scrubbing for point-source carbon capture, have demonstrated significant potential, their adoption rate remains insufficient to achieve critical climate mitigation goals. Barriers such as high-energy consumption and the complexity of retrofitting existing industrial infrastructure hinder wider implementation. At the same time, emerging negative-emission technologies, such as direct air capture, direct ocean capture and enhanced weathering, are sparking substantial interest and entrepreneurial innovation worldwide. Despite successful pilot projects, broader adoption barriers remain pertaining to economic feasibility and scalability issues, which must be swiftly addressed.

In this context, *Carbon Technologies* seeks to serve as a vibrant nexus for the exchange and advancement of groundbreaking research among academic and industry stakeholders. The journal warmly welcomes interdisciplinary contributions from engineers, chemists, biologists, economists, environmental scientists and alike, particularly those working collaboratively across these disciplines.

Our journal emphasizes key aspects of carbon capture technologies across various applications, including both pre- and post-combustion capture of industrial emissions and innovative negative-emission strategies. Research investigating novel methodologies, such as advanced sorption techniques, membrane separation, electrochemical and photochemical methods, carbon mineralization, chemical looping, as well as biological capture systems, will be especially valued.

We also strongly encourage comprehensive, cross-scale research into new materials, innovative processes and fundamental mechanistic insights into chemical, multiphase, thermodynamic and kinetic aspects of carbon capture, as well as studies on material degradation pathways. Crucially, our scope further encompasses critical evaluations of process integration and intensification, techno-economic analyses and detailed life-cycle assessments, all of which are essential for ensuring practical, scalable and sustainable technology solutions.

Through this focused effort, we aim to accelerate meaningful innovation in carbon capture, significantly enhancing our collective impact in addressing global climate change.

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