

Synthesis and CO₂ absorption and regeneration of absorbent nano-functionalized

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The escalating global concerns regarding climate change and greenhouse gas emissions have intensified the search for efficient carbon capture technologies. In this context, nanofluids, colloidal suspensions of nanoparticles in a base fluid, emerge as a promising solution to enhance the performance of carbon capture processes.

Nanofluids exhibit exceptional heat transfer characteristics due to the enhanced thermal conductivity conferred by nanoparticles. This property is leveraged in carbon capture processes to optimize heat exchanger performance, reducing energy consumption and operational costs. Moreover, the incorporation of nanoparticles into the capture absorbent enhances the overall absorption capacity, leading to improved capture efficiency.

The tunable properties of nanofluids enable customization for specific capture conditions and offer a versatile platform for addressing the challenges associated with conventional carbon capture technologies.

The scalable and cost-effective synthesis of nanofluids further contributes to the feasibility of widespread adoption.

In this work a test campaign was carried out in which the increase in absorption capacity and the reduction in regeneration duty of base absorbent were tested with the addition of nanoparticles of titania (TiO₂) in different percentages and at different temperatures of absorption.

In conclusion, nanofluids represent a novel and efficient avenue for advancing carbon capture technologies, with the potential to revolutionize the landscape of sustainable carbon capture. This abstract provides insights into the key mechanisms and advantages of utilizing nanofluids in carbon capture, offering a foundation for future research and development in this critical field.