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"Gheorghe Asachi" Technical University of Iasi, Romania

EVALUATING THE EFFICACY OF ZEOLITE ADSORBENTS IN CADMIUM REMOVAL AND ITS ENVIRONMENTAL IMPLICATIONS

Khalid A. Alkhuzai

Faculty of Engineering, Al-Baha University, Al-Baha, 4781, Saudi Arabia
E-mail address: khalidaalkhuzai@gmail.com; Phone: +966177952340.

Abstract

Cadmium (Cd) contamination poses a significant threat to human health and the environment, demanding effective and sustainable remediation solutions. This review evaluates the efficacy of zeolite adsorbents in removing Cd from contaminated water sources, examining their diverse properties, adsorption mechanisms, and environmental implications. The study highlights the advantages of both natural and synthetic zeolites, their ability to remove Cd effectively, and the enhanced performance achieved through modifications like chitosan-zeolite composites, Fe_3O_4@zeolite, and nZVI-zeolite. The review emphasizes the importance of pH optimization for Cd removal, analyzes adsorption isotherm models and kinetic studies, and underscores the need for careful material selection and experimental conditions for optimal performance. Despite their promising potential, further research is crucial for advancing zeolite-based Cd removal, including the development of novel composite materials, the optimization of synthesis and modification techniques, the assessment of long-term stability, and the exploration of large-scale applications for real-world scenarios. The review concludes by highlighting the importance of continued research in this field to fully harness the potential of zeolites for a cleaner and healthier future.

Keywords: adsorption, cadmium removal, environmental implications, water treatment, zeolite adsorbents

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