

Assessment of Biochar Filtration Technologies for Decontaminating Environmental Water Sources

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Efficient wastewater treatment is essential due to widespread water contamination from the use of chemicals such as pharmaceuticals, hormones, toxic metals, and agrochemicals. Evaluating water treatment methods through real-world case studies and validating their practical efficiency remains challenging due to limitations of routine analytical methodologies. This study examines the applicability of biochar in a fixed-bed adsorption system as a wastewater treatment technology and evaluates residual pollutant concentrations using advanced analytical techniques. Preliminary experiments were conducted with high-performance liquid chromatography and UV diode array detection (HPLC-UV) to optimize parameters for removing sulfamethoxazole, the target pollutant. Under optimized conditions, the column could process 30 L of polluted water and maintain operational retention efficacy for up to 130 hours. This suggests that the technology can be applied to surface and wastewater samples. Further validation involved analyzing real water samples with LC/MS-MS using an untargeted method. The results showed a significant reduction in the concentration of various contaminants, demonstrating the effectiveness of the proposed treatment in real-world conditions.

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