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## ASSESSMENT OF COW BONE BIOCHAR PERFORMANCE IN FIXED-BED COLUMN ADSORPTION OF COPPER(II) FROM AQUEOUS SOLUTION

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### Abstract

This study investigates the adsorption potential of biochar derived from cow bone, a byproduct of the meat industry, to recycle it into a valuable product capable of eliminating copper from water. A series of experiments was conducted to assess the influence of flow rate, initial copper concentration, and bed height on the performance of fixed-bed adsorption columns containing cow bone biochar (CBB). Results show that the maximum adsorption amount in the column reached 115.2 mg/g, with a maximum adsorption capacity of 10.7 mg/g achieved at an influent concentration of 100 mg/L. The column can work for more than 2400 minutes to finish the breakthrough curve, showing the good stability of the system. This exceptional performance is attributed to the high surface area, porosity, and various functional groups present on the surface of CBB. The adsorption process was analyzed using the Thomas, Adams-Bohart, and Yoon-Nelson models, with the CBB performance aligning well with previous studies, showcasing its potential for industrial applications. The Thomas model was considered suitable for breakthrough curves ( $R^2=0.9758$ ). These findings underscore the significance of CBB as a promising material for copper removal from water and pave the way for further research and development in this area.

*Key words:* adsorption, biochar, breakthrough curves, circular economy, heavy metals

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