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Adsorption mechanism of Cu(II) in water environment using chitosan-nano zero valent iron-activated carbon composite beads

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ABSTRACT

Copper ions (Cu(II)) produced from various industries can lead to pollution at toxic levels, eventually finding its way into food chains and resulting in serious health impairment. Among different treatment technologies practiced, adsorption is unique in terms of its versatility and economic feasibility. Here, the removal of Cu(II) was examined using chitosan-nano zero valent iron-activated carbon (CS-NZVI-AC) composite beads. Results indicate that the rate of Cu(II) adsorption onto the CS-NZVI-AC accelerated significantly in comparison with lonechitosan (CS), activated carbon (AC) and zero valent iron (NZVI). Moreover, the hybridization of CS-AC with NZVI endows an increase in the uptake of Cu(II) up to 30% compared to that of CS-AC alone. The adsorption mechanism is understood as chemisorptions along with the active Van der Waals forces, as supported by the best fit of sorption data with pseudo-second order kinetics and Freundlich isotherm model. The adsorption capacity of CS-NZVI-AC for Cu(II) increased with increasing pH of up to 5 and with 25°C water temperature. Thus, it is indicated that this hybrid CS-NZVI-AC composites have great potential for environmental remediation efforts for Cu(II) and other similar heavy metal ions.

Keywords: Chitosan; Activated carbon; Zero valent iron; Adsorption; Kinetic; Equilibrium; Remediation

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