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Adsorption characteristic of Cd^{2+} on the nano-hydroxyapatite/biochar hybrid materials derived from rice husk and eggshells

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ABSTRACT

Industrial wastewater of cadmium ions in the environment needs to be solved urgently. Nano-hydroxyapatite and low-cost rice husk-egg shells biochar were successfully hybridized to form nano-hydroxyapatite/biochar hybrid materials (HBC) for the adsorption of Cd^{2+} in aqueous solution. Scanning electron microscopy, BET, X-ray diffraction and Fourier-transform infrared spectroscopy were used to characterize HBC. The results showed that compared with the biochar (BC), the adsorption efficiency and adsorption capacity of HBC were greatly improved. Specifically, the adsorption efficiency was increased by 50%, and the saturated adsorption capacity was increased from 23.835 to 35.2875 mg/g, which was increased by 48%. The adsorption mechanism of HBC on Cd^{2+} is complex. Chemical adsorption and multilayer adsorption provide the most important contribution, and various adsorption methods such as surface complexation, ion exchange, dissolution and precipitation also affect the adsorption of Cd^{2+}. In general, HBC is an efficient and environmentally friendly adsorbent, which can be used for the removal of Cd^{2+} from aqueous solution and has high adsorption capacity and cost effectiveness.

Keywords: Biomass; Biochar; Nano-hydroxyapatite; Cd^{2+}; Adsorption

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