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Fabrication and characterization of hydrophilic corn stalk biochar-supported nanoscale zero-valent iron composites for efficient metal removal

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Abstract

Pyrolyzing low-cost agro-waste into biochar is a promising means for waste biomass utilization. This study engineers corn stalk-derived biochar with abundant hydrophilic functional groups as a support material for iron nanoparticles impregnation (nZVI-HCS). Surface chemistry and morphology of nZVI-HCS composites is characterized by SEM, TEM, TG, XRD, FTIR, XPS, and BET techniques, which helps to elucidate the mechanisms of Pb^{2+}, Cu^{2+} and Zn^{2+} removal from single and mixed-metal solutions in batch experiments. Equilibrium adsorption capacities can reach 195.1, 161.9 and 109.7 $mg \cdot g^{-1}$ for Pb^{2+}, Cu^{2+} and Zn^{2+} at neutral medium after 6-h process, respectively. The engineered biochar with