Adsorption of copper(II) from Aqueous Solution on Crosslinked Chitosan Intercalated Clay

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Copper has been concerned as important toxic heavy metal due to its adverse effects on both environment and human health. Biopolymer, chitosan, is considered as the effective adsorbent in adsorption processes to remove heavy metals. Modified chitosan was performed to overcome their original limitations, such us high cost and solubility properties in diluted acid media. The experimental results indicated that bentonite exhibited higher adsorption capacity for Cu^{2+} than kalonite as supporting material for chitosan. Crosslinked chitosan intercalated bentonite by ethylene glycol diglycidyl ether and epichlorohydrin as crosslinking agents (CIB-EGDE and CIB-ECH beads) improved the adsorption capacity and the strength of adsorbent beads for Cu^{2+} removal from aqueous solution, which exhibited higher adsorption capacity than chitosan intercalated bentonite by glutaraldehyde as crosslinking agent (CIB-GLA beads). Under equilibrium condition, the adsorption of Cu^{2+} fitted very well with Langmuir isotherm for CIB-EGDE and CIB-ECH beads and Freundlich isotherm for CIB-GLA beads. All the adsorptions under deferent supporting materials were fitted well with pseudo-second-order kinetic model. CIB-EGDE and CIB-ECH beads were evidenced to capture Cu^{2+} ions in the solution at pH 3 and release Cu^{2+} ions at pH 1 of solution. Moreover, the characteristic and morphology of the new adsorbents were examined by zeta-potential, SEM, XRD, BET and FTIR, which confirmed the physical characteristic of these synthesized materials under Cu adsorption behavior. Therefore, this research indicated that the modification of chitosan for Cu^{2+} removal from aqueous solution was successful.

Keywords: Adsorption isotherm; Kinetics; chitosan intercalated bentonite; chitosan intercalated kaolinite.