Effective removal of cadmium ions from aqueous solution using chitosan-stabilized nano zero-valent iron

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ABSTRACT

In this study, a series of chitosan-stabilized nano zero-valent iron (CNZVI) composites with different amounts of chitosan were prepared and characterized by Fourier transform infra-red spectra, X-ray diffraction, and transmission electron microscopy. The adsorption capacity of these composites was evaluated by the removal experiment of cadmium ion (Cd\(^{2+}\)) from aqueous solution. These results showed that the as-prepared CNZVI\(_8\) composite with loose aggregate structure has the maximum adsorption capacity for Cd\(^{2+}\). Furthermore, batch adsorption experiments of Cd\(^{2+}\) on CNZVI\(_8\) composite were performed under various conditions, such as contact time, adsorbent dosage, initial Cd\(^{2+}\) concentration, and the initial pH of solution. The data revealed that the maximum adsorption capacity of CNZVI\(_8\) is 124.74 mg/g. The removal efficiency of Cd\(^{2+}\) increased with the increase in solution pH value, and reaches 99.9% at pH 6. In addition, the adsorption isotherm and the adsorption kinetics of Cd\(^{2+}\) on CNZVI\(_8\) were also investigated, suggesting that the isothermal data were well fitted to the Langmuir model and the kinetic data were well suitable to the pseudo-second-order kinetic model.

Keywords: Nano zero-valent iron; Chitosan; Adsorption; Cadmium ion