Removal of tetracyclines from aqueous solution by nanoscale Cu/Fe bimetallic particle

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ABSTRACT

Bimetallic nanoparticle (BNP) that comprises nanoscale zero-valent iron with a noble metal such as Pd, Pt, Ni, Ag, or Cu has been effective in removing various organic and inorganic compounds. In this study, the removal performance of tetracycline antibiotics, tetracycline (TC), oxytetracycline (OTC), and chlortetracycline (CTC), from aqueous solution by nanoscale copper/iron (Cu/Fe) bimetallic particle was investigated. Batch experiments were performed to evaluate the effect of experimental variables such as solution pH, bimetallic particle dosage, and temperature on the removal efficiency of tetracyclines. The results obtained from the study indicated that the removal rate of tetracyclines was greatly dependent on pH. The removal of TCs above 90% was achieved at optimum conditions. The Langmuir and Freundlich adsorption models were applied to experimental data and the results fitted to Langmuir model. The pseudo-first-order and the pseudo-second-order models were used to express of adsorption kinetics and it was found that the adsorption kinetics were followed the pseudo-second-order kinetic model.

Keywords: Tetracycline; Oxytetracycline; Chlortetracycline; Nanoscale zero-valent iron; Copper/iron bimetallic particle