Biosorption of copper (II) ions from synthetic aqueous solutions by drying bed activated sludge

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Abstract :

In the present work, the usefulness of dried activated sludge has been investigated for the removal of copper ions from synthetic aqueous solutions. Kinetic data and equilibrium sorption isotherm were measured in batch conditions. The influence of some parameters such as: contact time, initial copper concentration, initial pH of solution and copper salt nature on copper biosorption kinetics has been studied. Copper uptake was time contact, initial copper concentration, initial pH solution and copper salt type dependent. Maximum copper sorption was found to occur at initial pH 5. Two simplified kinetic models including a first-order rate equation and a pseudo second-order rate equation were selected to describe the biosorption kinetics. The process followed a pseudo second-order rate kinetics. The process mechanism was found to be complex, consisting of external mass transfer and intraparticle mass transfer diffusion. Copper biosorption process was particle-diffusion-controlled, with some predominance of some external mass transfer at the initial stages for the different experimental parameters studied. Langmuir and Freundlich models were used to describe sorption equilibrium data at natural pH of solution. Results indicated that the Langmuir model gave a better fit to the experimental data than the Freundlich model. Maximum copper uptake obtained was q(m)=62.50mg/g (0.556 mmol/g) under the investigated experimental conditions. Scanning electron microscopy coupled with X-ray energy dispersed analysis for copper-equilibrated dried activated sludge demonstrated that copper existed on its surface.

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