Kinetic analysis for the removal of copper using Durvillaea antarctica

ABSTRACT

Existing techniques for the treatment of pollutants include membrane separation, ion exchange, precipitation, and transformation and biosorption. Of all this technology, biosorption has several positive aspects which include low operating expenses, very efficient detoxification of toxicants at low concentrations, low amount of disposal materials and does not need nutrient requirements as in bacterial-based remediation, the latter of which is limited by the presence of heavy metals and other toxicants. The reduction of copper by Durvillaea antarctica, an algathat lives as south as the Antarctic region can be an efficient and low-cost tool for remediationof copper. In this study, the kinetics of copper biosorption is modelled according to the pseudo-first order, pseudo-second order and Elovich models. Statistical analysis based on root-mean- square error (RMSE), adjusted coefficient of determination (adjR2), bias factor (BF), accuracyfactor (AF) and corrected AICc (Akaike Information Criterion) showed that the pseudo-secondorder model is the best model. Kinetic analysis using the pseudo-second order model at 0.15 mM copper gave a value of equilibrium sorption capacity qe of 0.150 mmol g-1 (95% confidence interval from 0.149 to 0.151) and a value of the pseudo-second-order rate constant,k2 of 8.605 (95% confidence interval from 7.016 to 10.194).

Keyword: Biosorption; Durvillaea Antarctica; Kinetics; Copper; Pseudo-second order