

Competitive adsorption of Pb²⁺, Cd²⁺ and Zn²⁺ ions onto Eichhornia crassipes in binary and ternary systems

Courtie Mahamadi, Tichaona Nharingo

Abstract

A batch sorption technique was used to study the biosorption of Pb²⁺, Cd²⁺ and Zn²⁺ ions onto the vastly abundant water hyacinth weed, *Eichhornia crassipes* biomass in binary and ternary systems at a temperature of 30 C and pH 4.84. Mutual interference effects were probed using equilibrium adsorption capacity ratios, $q_0' = q_e$, where the prime indicates the presence of one or two other metal ions. The combined action of the metals was found to be antagonistic, and the metal sorption followed the order Pb²⁺ > Cd²⁺ > Zn²⁺. The behaviour of competitive biosorption for Pb–Cd and Pb–Zn combinations were successfully described by the Langmuir Competitive Model (CLM), whilst the model showed poor fitting to the Cd–Zn data. In conclusion, Pb²⁺ ions could still be effectively removed from aqueous solution in the presence of both Cd²⁺ and Zn²⁺ ions, but removal of the Cd²⁺ and Zn²⁺ ions would be suppressed in the presence of Pb²⁺.