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Removal of lead, cadmium, and mercury ions using biosorption

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ABSTRACT

The biosorption of Pb (II), Cd (II), and Hg (II) from simulated aqueous solutions using baker's yeast biomass was investigated. Batch type experiments were carried out to find the equilibrium isotherm data for each component (single, binary, and ternary), and the adsorption rate constants. Kinetics pseudo-first and second-order rate models applied to the adsorption data to estimate the rate constant for each solute, the results showed that the Cd (II), Pb (II), and Hg (II) uptake process followed the pseudo-second-order rate model with (R^2) 0.963, 0.979, and 0.960, respectively. The equilibrium isotherm data were fitted with five theoretical models. Langmuir model provides the best fitting for the experimental results with (R^2) 0.992, 0.9987, and 0.9995 for Cd (II), Pb (II), and Hg (II), respectively. The effect of various influent adsorbates concentration, and flow rate on the performance of fixed bed adsorber was found for the three heavy metals. A mathematical model was formulated to describe the breakthrough curves in the fixed bed adsorber for each component. The results show that the mathematical model provides a good description of the adsorption process for Cd (II), Pb (II), and Hg (II) onto fixed bed of baker's yeast biomass.

Keywords: Biosorption; Yeast; Cd (II); Pb (II); Hg (II); Fixed bed; Mathematical model; Mass transfer coefficient

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