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ADSORPTION OF Zn^{2+} AND Ni^{2+} IONS FROM AQUEOUS SOLUTION ONTO *Phyllanthus debilis:* KINETICS & EQUILIBRIUM STUDIES

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Abstract

This work evaluates the potential of *Phyllanthus debilis* for the adsorption of Zn^{2+} and Ni^{2+} ions using synthetic solutions. Adsorption experiments were performed in order to examine the effect of pH, contact time, biomass concentration and initial metal ion concentration in the removal process, in a batch mode. The results revealed that the adsorption is highly pH dependent. The adsorption of Zn^{2+} and Ni^{2+} ions were concentration dependent and increased from 2.446 to 8.688 mg/g for Zn^{2+} and 2.26 to 7.744 mg/g for Ni^{2+} with an increase of concentration from 25 to 100 mg/L at pH 5. The adsorption mechanism was examined by FTIR technique and SEM. Isotherm and kinetic studies were carried out for the adsorption of Zn^{2+} and Ni^{2+} ions from aqueous solution using *P. debilis* at different initial metal ion concentration. Isotherms results were amply fitted by the Langmuir model, determining a monolayer maximum adsorption capacity (q_m) of *P. debilis* biomass equal to 8.97 mg g^{-1} and 11.39 mg g^{-1} for Zn^{2+} and Ni^{2+} ions respectively, and suggesting a functional group limited adsorption process. In order to evaluate kinetic parameters for Zn^{2+} and Ni^{2+} adsorption, Lagergren's first-order, pseudo-second-order, Elovich kinetic model and intra-particle diffusion models were explored. It was found that the pseudo-second order kinetic model fitted very well the experimental data. The rate determining step is described by intra-particle diffusion model.

Key words: adsorption, heavy metals, isotherm, kinetics, *Phyllanthus debilis*

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