

Biosorption and desorption of nickel on oil cake: batch and column studies

ABSTRACT

Biosorption potential of mustard oil cake (MOC) for Ni(II) from aqueous medium was studied. Spectroscopic studies showed possible involvement of acidic (hydroxyl, carbonyl and carboxyl) groups in biosorption. Optimum biosorption was observed at pH 8. Contact time, reaction temperature, biosorbent dose and adsorbate concentration showed significant influence. Linear and non-linear isotherms comparison suggests applicability of Temkin model at 303 and 313 K and Freundlich model at 323 K. Kinetics studies revealed applicability of Pseudo-second-order model. The process was endothermic and spontaneous. Freundlich constant (n) and activation energy (E_a) values confirm physical nature of the process. The breakthrough and exhaustive capacities for 5 mg/L initial Ni(II) concentration were 0.25 and 4.5 mg/g, while for 10 mg/L initial Ni(II) concentration were 4.5 and 9.5 mg/g, respectively. Batch desorption studies showed maximum Ni(II) recovery in acidic medium. Regeneration studies by batch and column process confirmed reutilization of biomass without appreciable loss in biosorption.

Keyword: Thermodynamics; Kinetics; Desorption; Regeneration; Breakthrough capacity