**Abstract**

The treated biomasses of terrestrial plant materials have high removal capacities for a number of heavy metal ions. The batch equilibration mode of study is employed to assess the sorption capacity of treated fruit shell husk of *Terminalia catappa* (TFSHTC) in the removal of Ni (II) ions. The factors influencing the adsorption process, namely, particle size, contact time, adsorbent dosage, pH, and temperature are experimentally verified. Based on the equilibrium concentration between sorbent-sorbate molecules and the amount of the species adsorbed, various isothermal models, viz., Langmuir, Freundlich and Dubinin-Radushkevich are correlated.The linearity of the plots obtained for Ni-TFSHTC system indicated that the Langmuir (R2-0.908) model correlates well with the data as compared to Freundlich and D-R isothermal equations. According to the Langmuir isotherm, the monolayer saturation capacity (Qo) is 62.5 mg/g. The pseudo first order, pseudo second order, and intraparticle diffusion kinetic models are applied to the experimental data pertaining to the initial metal ion concentrations and adsorbent doses. Thermodynamic parameters showed that the sorption process of Ni(II) onto TFSHTC is feasible and spontaneous. The observed results and calculated values imply that the TFSHTC can be employed as an effective and environment-friendly material for the removal of Ni (II) ion