**Abstract**

The present work aims at examining the potentiality of the identified no- cost sorbent Prosopis juliflora barks to remove Pb(II) and Cd(II) ions from aqueous solutions. Prosopis juliflorabarks are collected from Coimbatore, washed with doubly distilled water, dried, pulverized and treated using 0.1N HCl. The characteristics and functional groups present in the treated barks are analyzed by SEM, EDAX and FTIR techniques. Variable parameters influencing the adsorption of divalent ions onto the treated barks are verified by Batch Equilibration method. Effective experimental results are derived under the following optimized conditions: 15 min agitation time, pH 5 environment for the trapping of Pb(II) ions (93% removal) and 20 min agitation time, pH 7 environment for trapping Cd(II) ions (81% removal) at a particle size of 0.18mm, 300 mg dosage and an initial metal concentration of 100 mg/ L. Isothermal analysis of Langmuir and Freundlich models are studied where the best linear fit is exhibited by Langmuir model for both the systems. The obtained results indicate that TPJB is a promising material in chelating Pb(II) in comparison to Cd(II) ions. This shall be attributed to the fact of enlarged ionic radii of Pb(II) ions than Cd(II) ions favoring better sorption in case of the former. Extension of the study is driven towards the applicability of TPJB to sequestrate the heavy metals from industrial outlets.