**Abstract**

The present work emphasizes the utilization of Prosopis juliflora bark, an agro waste material for the adsorption of Cu(II). The raw Prosopis juliflora bark (PJB) is treated using 0.1N hydrochloric acid to enhance the sorption efficiency. The characterization studies of TPJB using Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Analysis (EDAX), Brunauer-Emmet-Teller(BET) and Barrett-Joyner-Halenda (BJH) analyses carried out. The batch mode experimental set up is verified to assess the sorption capacity of the chosen material for the operating factors viz., particle sizes/ doses of the sorbent material upon a range of initial concentrations of Cu(II) at different temperatures, agitation time and pH of the Cu(II)- TPJB system. The amount of Cu(II) ion adsorbed on to TPJB surface is found to be 43.11 mg/g (97.4%) under optimized conditions, its efficiency 3 fold times more than the Ce values reported by other researchers. The sorption characteristic of TPJB is quantitatively estimated through column experiments based on the Ce value by batch mode. The removal is observed as 98%. Langmuir, Freundlich and Tempkin isothermal curves at various initial concentrations are plotted for Cu(II)-TPJB system wherein the straight line fit is best suited for the Freundlich isotherm model. The results show that the response of TPJB in trapping Cu(II) ions are influenced by various parameters being statistically verified using SPSS software, indicative of good correlation.