**Abstract**

Rapid industrialization has significantly contributed to the release of toxic heavy metals into the water bodies. Increasing accumulation and magnification of these metals through the food chain lead to severe health hazards. Effluents containing nickel ions from various industries viz., electroplating, batteries manufacturing, mining, metal finishing have been discharged into water bodies either directly or indirectly without adequate treatment. The current work was focused to evaluate the feasibility of bivalve shells (BVS), a novel bio-material for the removal of Ni(II). Excess alkaline nature of BVS was controlled by neutralization with 0.1 N HCl for 3 h (Treated Bivalve Shells-TBVS). Microscopic, FTIR, SEM and EDAX analyses were carried out to assess the characteristic nature of the chosen material. The potentiality of the bio-material was experimentally verified and the conditions were optimized for varied parametrics viz., particle sizes, doses of bivalve shells at different time intervals, initial concentrations of Ni(II) solutions, pH and temperature environments. The initial and residual Ni(II) concentrations were analyzed using Atomic Absorption Spectrophotometer (SHIMADZU-AA-6200). Langmuir and Freundlich models were applied to describe the adsorption capacity. Calculated thermodynamic parameters revealed that the system was spontaneous, feasible and endothermic in nature. Maximum percentage (98%) removal of Ni(II) indicated the effective sorption efficiency of TBVS.