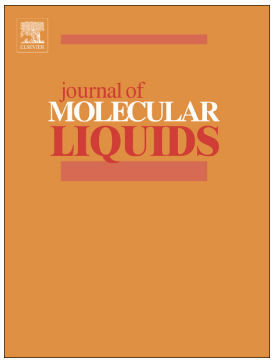

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Water and Soil Decontamination of Toxic Heavy Metals using Aminosilica-Functionalized-Ionic Liquid Nanocomposite

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Abstract

A chemical modification method is presented to establish a surface functionalization procedure of amino modified nanosilica (NS-amine) with 1-(3-cyanopropyl)-3-methylimidazolium-bis(trifluoromethylsulfonyl) type of ionic liquid, $[CN\text{-}C_3\text{-}MIm]^+[NTf_2]^-$ for the formation of a novel NS-amine-IL nanocomposite. Based on the TEM analysis and DLS technique, the diameter of the proposed nanocomposite was found 25.4±0.8 nm. The designed NS-amine-IL nanocomposite was additionally characterized using FT-IR, XRD, EDX, TGA, SEM and Zeta potential. The sequestration performance of NS-amine-IL was investigated for remediation of bivalent lead and cadmium ions from aqueous solutions. The effects of medium acidity, contact time, NS-amine-IL dosage, interfering ions, temperature and initial adsorbates concentrations on the removal processes of investigated cations were excessively studied. The maximum extraction values of Pb(II) and Cd(II) were recorded at pH 4-5 and pH 7, respectively. The thermodynamic profiles of the adsorption process were searched at optimal conditions. The adsorption processes were feasibly endothermic and fitted well with the Langmuir isotherm and *pseud*o-second-order kinetics equation. The experimental data indicated that the novel nanocomposite was a promising material for the extraction of both metal ions from wastewater and soil samples with determined recoveries 98.0-99.0%±4.9.