Purification of Groundwater from Heavy Toxic Metals using Suspended Polydentate Supported Ligands

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Abstract

This study aims to prepare and develop several vehicles chelation polydentate supported ligands and then installed it using sol-gel or polymerization or to be susceptible to imply conjunction with the highly toxic heavy metal ions in the water and disrupted the underground water used for drinking or agriculture, as the process of interaction between ligands and heavy metals depends on the circumstances surrounding conditions which are treated in this research. Metal ion uptake through complexation or hydrogels can be affected by hydrophilic-hydrophobic balance, the nature of chelate ligands and the extent of cross-linking of macromolecular supports. Ligand function also dictates reactivity, complexation ability and efficiency of polymer supported ligands in the present case expected to be good solution for such problem.

This research involves the synthesis and characterization of new polysiloxane surfaces modified with ortho-, meta-, or para-nitrophenyl moieties. The resulting adsorbents have been characterized by SEM, IR, UV, ^{13}C solid state NMR, BET surface area, B.J.H. pore sizes and TGA. These porous materials showed a very good thermal and chemical stability and hence they can be used as perfect adsorbents to uptake Cd(II), Pb(II) and Ni(II) from groundwater taking from Burqin town in Palestine. In order to investigate the adsorption efficiency for each adsorption process. The effect of solution conditions on each adsorption process were studied. These conditions involve the effect of contact time, pH value, temperature, adsorbent dose and the initial concentration of adsorbate. The maximum extent of adsorption was for (Si-p-NO_2) polymer in the presence of lead ions. This adsorption process needed only 1 minute of shaking to have 99.95% as percent of Pb(II) removal at solution conditions of 20°C temperature, pH value equals 8, 5 mg adsorbent dose, 50 ppm of Pb(II) solution as initial concentration and 7 mL solution volume.

The best equilibrium isotherm model for each adsorption process was investigated using Langmuir and Freundlich isotherm adsorption models. The kinetics of adsorption were also investigated using pseudo first-order, pseudo second-order and intra-particle diffusion kinetic models. In addition, Van't Hoff plot for each adsorption was investigated in order to determine the values of enthalpy change and entropy change.