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

This study aims to prepare several vehicles chelation polydentate supported ligands in order to be susceptible to imply conjunction with the highly toxic heavy metal ions in the water including lead, nickel and cadmium ions, 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 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 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, TGA and nitrogen adsorption-desorption
isotherm. These porous materials showed a very good thermal and chemical stability and hence they can be used as perfect adsorbents to uptake toxic heavy metal ions including Cd(II), Pb(II) and Ni(II) from groundwater taking from Burqin town in Palestine. The concentrations of each adsorbate in the filtrate were determined using Atomic Absorption Spectrophotometer. The results showed that all of the three resulting products have high adsorption efficiency. Also, it showed strong complexation properties with heavy metal ions.

In order to investigate the adsorption efficiency for the adsorption of Cd(II), Pb(II) or Ni(II) onto (Si-o-NO_2), (Si-m-NO_2) or (Si-p-NO_2), 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. For cadmium and nickel ions, the maximum percent of removal was 98.99% in the presence of (Si-m-NO_2) adsorbent.

The best equilibrium isotherm model for each adsorption process was investigated according to the value of the correlation coefficient of 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, and hence determining if the adsorption process is spontaneous or not, and if it is exothermic or endothermic one. The results showed that all of these adsorptions followed Langmuir adsorption isotherm and the mechanism of all of these reactions followed pseudo second-order kinetic adsorption model. The thermodynamic parameters of all the adsorptions proved that these processes are endothermic ($\Delta H > 0$) and non spontaneous ($\Delta S < 0$).

Each of the synthesized polymers was also regenerated, and the percentage removal before and after adsorbent recovery is determined. The results showed a promising percent of removal for Cd(II), Pb(II) and Ni(II).