
Synthesis and characterization of some polymers for removing of some heavy metal ions of industrial wastewater

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The main aim of this study is to synthesise some polymers to find the optimum conditions for the removal of some heavy metal ions such as Cu(II), Ni(II) and Cr(VI) ions from the industrial wastewater. The work carried out in this thesis is summarized into three main parts; namely, introduction, experimental and finally results and discussion. The first chapter is introduction and literature which includes a brief account on the classification of synthetic ion exchanger, inorganic and organic ion exchanger, characterization and physicochemical properties of organic ion exchanger, application of ion exchange techniques for the treatment of some heavy metal ions. The second chapter is materials and methods which includes the chemicals and their chemical purity, the method of preparation of synthetic polymer of modified epoxide with hardener and carboxylic groups (I), modified PVC(II) with ethylene diamine and MDI, modified PU (III) with ethylene diamine and acrylic acid, modified the previous modified PU with carboxylic group (IV), modified starch (V) with epoxide and hardener and finally modified the previous starch with carboxylic groups (VI), as well as the instrumentation, the analytical techniques and the procedures used in this thesis. The third chapter deals with the results and discussion and is divided into main sections namely; preparation of polymer resin and their chelates then their studies by using IR, ¹HNMR. X-ray spectra and TG analysis to determine the structure of polymer resin and their metal complexes. Then studies of the effect of amount of adsorbents, effect of time, effect of pH, and effect of temperature on the removal of individual and mixed heavy metal ions from electroplating wastewater led to the following conclusions: The experiments showed that metal ions were adsorbed at pH 8-9 in case of Cu(II) and Ni(II) ions and show lower percentage of swelling, these two characters are essential for an adsorbents that it can be used as a resin in ion exchange, whereas pH 3-4 is suitable for Cr(VI) ions. Carboxylic groups on both modified PU and cross-linked beads starch, show high adsorption efficiency than modified PU and the cross-linked beads in case of modified starch. Similarly the results obtained for the uptake of individual solution of Cu(II), Ni(II) and Cr(VI) ions, using modified PVC which showed that adsorption efficiency increases as pH >8 for both Cu(II), Ni(II) and at pH