

REMOVAL OF HEAVY METALS FROM WASTE WATER USING LOCALLY DERIVED CHITOSAN

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Degree of Master of Engineering

Department of Mechanical Engineering

University of Moratuwa

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Thesis submitted in partial fulfillment of the requirements for the degree
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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Signature of the supervisor:

Date:

Name of the supervisor: Dr. S.U. Adikary

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Abstract

In this research work natural bio polymer “chitosan” was synthesized using locally available shrimp shells and adsorption of chromium by chitosan was studied. Synthesis of chitosan involved four main stages as preconditioning, demineralization, deproteination and deacetylation. “Preconditioning” process is a new step introduced in this research, to remove loosely bound protein. In the preconditioning, the skeletal matrix structure is first weakened which makes easier to remove soluble protein by washing with water. Therefore during deproteination process less alkali concentration can be used. Effect of deacetylation conditions such as alkali concentration, number of times of deacetylation performed and reaction temperature was investigated. Chitosan was characterized using Fourier Transform Infrared Spectroscopy (FTIR), Differential Thermal analysis (DTA), Thermal Gravimetric Analysis (TGA) and X-ray diffraction (XRD). These characterization techniques confirm the existence of chitosan. Degree of deacetylation was calculated using FTIR spectra. This value was highly depending on reaction temperature, reaction time, alkali concentration and number of times of deacetylation. Both characterization techniques confirm the existence of chitosan.

The affinity of chitosan for chromium was studied using $K_2Cr_2O_7$ solution as the heavy metal solution containing Cr (VI) ions. Adsorption of chromium ions by chitosan was investigated under different conditions. The effect of reaction temperature, particle size of chitosan and pH of solution were studied. Amount of chromium absorbed under different conditions was evaluated using atomic absorption spectroscopy.

Key words: Bio-adsorption, heavy metals, chitosan, chromium




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