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Removal of Heavy Metal Ions from Water Using Chelating Copolymer Resin-IV Derived from 2-Hydroxy, 4-Methoxybenzophenone, 1, 5-Diaminonaphthalene and Formaldehyde

Narayan Chandan Das [1,*] and Wasudeo B. Gurnule [2]

[1] *Department of Chemistry, Dr. Ambedkar College of Arts, Commerce and Science, Chandrapur-442401, India.*
[2] *Department of Chemistry, Kamla Nehru Mahavidyalaya, Nagpur-440024 (M. S.), India.*

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Abstract

The resin 2-H, 4-MBP-1,5-DANF-IV was synthesized by the condensation of 2-hydroxy, 4-methoxybenzophenone and1, 5-diaminonaphthalene with formaldehyde in the presence of hydrochloric acid as a catalyst. The resin was characterized by elemental analysis, infrared (IR) spectroscopy, nuclear magnetic resonance (NMR) spectroscopy and UV-Visible spectral studies. The chelation ion-exchange properties was studied for Ni^{2+}, Cu^{2+}, Co^{2+}, Zn^{2+} and Pb^{2+} ions employing a batch equilibrium method. It was used to study of the selectivity of metal-ion uptake involving the measurements of the distribution of a given metal ion between the copolymer sample and a solution containing the metal ion. The study was carried out over a wide pH range and in media of various ionic strength.The resin depicted a higher selectivity for Cu^{2+} and Ni^{2+} ion than for Co^{2+}, Zn^{2+} and Pb^{2+} ions.

Keywords: Copolymer; Ion-exchange properties; Batch equilibrium; Chelating; Concentration

1. Introduction

Many industries are responsible for polluting the with heavy metal ions contained in their waste water. The heavy metal ions present in waste water are one of the harmful pollutants of the environment as it accumulates in living tissues, causing many destructive effects. Effluents generated by industries such as non-ferrous metal works, aircrafts plating, petroleum refineries etc. generally have a complex composition which includes metals ions or complexes suspended, solids and other components. Many methods have been developed for the removal of metal ions such as co-precipitation, electro deposition and solvent extraction. However the removal of metal ions by chelating ion exchange resin using Batch equilibrium method has gained rapid acceptance because of its wide variety of high degree of selectivity, sorbent phases, enhanced hydrophilicity and high loading capacity [1].

Gurnule and coworker have synthesized the chelating ion-exchange resin from phallic acid - melamine - formaldehyde and characterized by FT-IR, ^{1}H-NMR and elemental analysis. Metal ion uptake capacity of the resin has been carried out by Batch equilibration method for different metal ions at different concentrations [2]. Separation of toxic metals ions from waste water using pyrogallol-biuret-formaldehyde copolymer resin has reported by Rahangdale et al. [3]. Gurnule et al. have studied the chelation ion exchange properties of copolymer resin synthesized from 1,5-diaminonaphthalene, 2,4-dihydroxypropiophenone and formaldehyde [4]. Comparative study of strong anion exchange poly (Styrene-co-EGDMA-co-VBC) and strong anion exchange hyper crosslinked poly (HEMA-co-EGDMA-co-VBC) was reported by N. Abdullah et al. [5].The copolymer resin synthesized from salicylic acid and diaminobenzoic acid with formaldehyde and its chelating ion-exchange properties was studied by Masram et al. and the resin was found to be, selectivity for Fe^{+3}, Cu^{2+} and Ni^{2+} ion than for Zn^{2+} , Co^{2+} and Pb^{2+} ions [6]. Ravichander et al. have synthesized and studied the antimicrobial

*Corresponding author: Narayan Chandan Das

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