

REMOVAL OF TOXIC METAL IONS USING ION-BINDING COPOLYMER RESIN BY BATCH EQUILIBRIUM TECHNIQUE

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ABSTRACT

Copolymer resin has been synthesized by the condensation of 8-hydroxyquinoline 5-sulphonic acid and semicarbazide with formaldehyde in 4:1:5 ratio in the presence of acetic acid as catalyst at $126 \pm 2^\circ\text{C}$ for 5 hours was proved to be a selective chelating ion-exchange copolymer for certain metal ions. On the basis of their elemental analysis composition of 8-HQ5-SASF-IV has been determined and conductometric titration in non-aqueous medium method has been used for determination of the number average molecular weight of this copolymer. The viscosity measurements in dimethylsulphoxide (DMSO) has been carried out with a view to ascertain the characteristic functions and constants. This newly synthesized 8-HQ5-SASF-IV copolymer resin was characterized by electronic spectra, FTIR spectra, ^1H NMR spectra. The surface morphology of the copolymer resin was examined by scanning electron microscopy and it establishes the transition state between crystalline and amorphous nature. Ion-exchange properties of this resin was studied by batch equilibrium method for Fe^{3+} , Cu^{2+} , Ni^{2+} , Zn^{2+} , Co^{2+} , Cd^{2+} and Pb^{2+} ions over the pH range, 2.5 to 6.5 and in media of various ionic strengths. The order of metal ion uptake at higher concentrations by the 8-HQ5-SASF-IV terpolymer at lower pH is $\text{Cu}^{2+} > \text{Ni}^{2+} > \text{Fe}^{3+}$. At higher pH level, the metal ion (Zn^{2+} , Co^{2+} and Pb^{2+}) uptake decreases while the concentration increases. Therefore the order of metal ion uptake at lower concentration is $\text{Zn}^{2+} > \text{Co}^{2+} > \text{Pb}^{2+}$. The amount of Pb^{2+} metal ion uptake by the 8-HQ5-SASF-IV terpolymer was very lower compared to all the other metal ions, because of the bigger hydrated size of Pb^{2+} ion.

Keywords: Copolymer; Degree of polymerization; Polycondensation, Ion-exchanger, Resin, Synthesis.

1 INTRODUCTION

The treatment of industry wastes has been a strong concern as it continues to grow day by day. One category of such industrial pollutants includes heavy metals, often contained in the wastewater. When released into the environment, these metals can cause severe damage to the human body, including accumulative poison, brain damage, and cancer [1-3]. Several processes were accessible for heavy metal removal, including chemical precipitation, membrane, and retention technique [4-6]. An effective technique to separate the selective metal