SYNTHESIS, CHARACTERIZATION AND MATHEMATICAL MODELING OF CHELATIONION-EXCHANGE APPLICATIONS OF COPOLYMER RESIN

Manish M. Yeole[1],Seema Shrivastava[2]and Wasudeo B. Gurnule[1]
[1]Department of Chemistry, KamlaNehruMahavidyualaya, Sakkardara, Nagpur 4400024, India.
[2]Department of Chemistry, Priyadarshani College of Engineering, Nagpur-440 019
E-mail: wbgurnule@yahoo.co.in, seemashrivastava@rediffmail.com

ABSTRACT

p-Hydroxybenzaldhyde and Oxamide with Formaldehyde (BOF) Copolymer was synthesized by the condensation polymerization technique. The elemental analysis and physico-chemical parameters of the copolymer were measured. This chelation copolymer was characterized by infrared, electronic and nuclear magnetic resonance (^{1}H &^{13}C NMR) spectral studies. The molecular weight of the copolymer was determined by gel permeation chromatography (GPC). Surface analysis of the copolymer was analyzed by scanning electron microscopy (SEM) and X-ray diffraction (XRD) method. The thermal stability of the copolymer was analyzed by thermogravimetric analysis (TGA). The cation-exchange property of the copolymer was determined by batch equilibrium method with the effect of pH, contacttime and electrolytes. The reusability of the resin was also studied to estimate the effectiveness of the copolymer resin.

An attempt has been done to present the metal ion selectivity of the resins with respect to time in the form of mathematical model. The model consists of two straight-line equations, involves all dependent and independent parameters. Graph obtained from actual experimental data is very much comparable to the graph plotted from the data provided by the model. This has been clearly shown by the reliability of the model, which is 94.6%.

Key words: Synthesis, Chelation, Resin, Copolymer, Characterization, Batch equilibrium Method.

INTRODUCTION

The term copolymerization refers to the simultaneous polymerization of three monomers together.Ion exchange may be defined as the reversible exchange of ions between the substrate and surrounding medium. Ion exchange technique can remove traces of ion impurities from water/process liquors and given out a product of ultra pure quality in a single efficient and techno-economically viable manner. Ion exchangers are widely used in analytical chemistry, hydrometallurgy, antibiotics, purification and separation of radioisotopes and find large application in water treatment and pollution control

The discharge of heavy metals into watercourses is a serious environmental problem that significantly affects the quality of the water supply. Increasing concentrations of these metals in the wastewater constitute a severe health hazard because of their toxicity, persistence in nature, and non-biodegradability, particularly when they exceed the permissible limits [1]. Heavy toxic metal ions are generally found together in a hydrometallurgical, recycling or wastewater process, preliminary separation of those metals ions are very essential at this juncture. Synthesis of *o*-nitrophenol and thiourea with *p*-formaldehyde terpolymer has been reported and its chelation ion exchange properties were investigated by static batch equilibrium method [2]. Lutfor et al [3] prepared a chelating ion exchange resin containing amidoxime functional group and was characterized by FT-IR spectra, TG and DSC analyses and chelating behaviour of prepared resin was studied with Cu (II), Zn (II), Ni (II), Cd (II) and Pb (II) metal ions. Samir et al [4]