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ABSTRACT: Grafted rubberwood fibre was converted to polyamidoxime ion-exchange resin in order to remove heavy metal ions from aqueous solution. The cation-exchange resin existed predominantly in the syn-hydroxyamino form. The water uptake by the resin was ca. 31 g/g dry resin while its hydrogen ion capacity was 3.6 mmol/g. The adsorption capacity of the resin towards different metal ions from wastewater was determined at different pH values within the range 1–6. The prepared chelating ion-exchanger exhibited the highest adsorption capacity towards Cu2+ ions (3.83 mmol/g), followed by Cd2+, Fe3+, Pb2+, Ni2+ and Co3+ ions, respectively. The results showed that the adsorption capacity depended on the solution pH. Polyamidoxime ion-exchange resin was also used to separate Co3+ and Ni2+ ions from Cu2+ ions using a column technique. On passing Cu2+/Ni2+ and Cu2+/Co3+ ion mixtures through the resin at pH 3, Cu2+ ions were adsorbed by the resin but no sorption of Ni2+ or Co3+ ions was detected. Approximately 98% of the Cu2+ ions could be desorbed from the resin. FT-IR spectroscopy was used to confirm the conversion of polyacrylonitrile-g-rubberwood fibre to polyamidoxime.

INTRODUCTION

Chelating resins having a wide applicability for the selective removal of metal ions and polymeric substances with the ability to complex with metal ions are very common. These materials, which have polyelectrolyte characteristics, have a very large number of sorption sites per macromolecule and have been used to remove toxic and polluting metal ions from wastewater and mine water (O’Connell et al. 2006; Farkas et al. 2001; Gurgel and Gil 2009; Lutfor et al. 2001, Andrzej et al. 2001, Chang et al. 2008, Lacour et al. 2001). Nitrile groups can be introduced onto cellulose by graft copolymerization of acrylonitrile onto cellulose (Farag and Al-Afaleq 2002, Kubota and Shigehisa 1995).

Ion exchange is a stoichiometric process in which any counterions that leave the ion-exchanger are replaced by an equivalent amount of other counterions (Navarro et al. 2001). This is a consequence of the requirement for electroneutrality. Such ion exchange is essentially a diffusion