Environmental Engineering and Management Journal *September/October 2009, Vol. 8, No.5, 1103-1109*
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

EQUILIBRIUM AND KINETIC STUDIES OF COPPER (II) REMOVAL ON PUROLITE S930 RESIN

Petru Bulai*, Cătălin Balan, Camelia Scripcariu, Matei Macoveanu

"Gh. Asachi" Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection, Department of Environmental Engineering and Management, 71 A, D. Mangeron Blvd., 700050 Iasi, Romania

Abstract

The presence of heavy metals in the environment is a major concern due to their non-biodegradability, bioaccumulation tendency, persistence in nature and toxicity to many life forms. Different treatment techniques for wastewater laden with copper have been developed in recent years to decrease the amount of wastewater produced and to improve the quality of the treated effluent. All techniques have their advantages and limitations in application. One of the most used techniques to remove copper from waste water is based on ion exchange process. In this study, the Purolite S930 resin with iminodiacetic acid (IDA) functional groups was used to remove Cu (II) ions from synthetic aqueous solutions. Batch sorption experiments were performed using both forms of the resin (sodium S930-Na and hydrogen S930-H) by varying the initial solution pH (1.0 – 5.0), initial concentration of copper (10 – 300 mg/L), temperature (20 – 40ºC) and contact time (10 minutes up to 24 hours). The practical capacity of the resin increases with the initial solution pH, temperature and concentration of copper ions. It was observed that, initially sorption increases rapidly, but after that, the rate becomes slower; the equilibrium can be considered attained after 24 hours. The equilibrium data were analysed using Freundlich, Langmuir and Dubinin–Radushkevich sorption isotherm models; sorption was best fitted by the Langmuir model. The values of calculated thermodynamic parameters (ΔG, ΔH and ΔS) indicate that the sorption is an endothermic and spontaneous process. The sorption kinetic data were tested using the pseudo-first order, pseudo-second order and intraparticle diffusion kinetic models; kinetic studies showed that the sorption of copper onto chelating resin followed a pseudo-second order reaction.

Key words: copper (II) removal, kinetics, Purolite S 930, sorption isotherm, thermodynamics

* Author to whom all correspondence should be addressed: e-mail: bulaipetru@yahoo.com