Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2016.1150891

57 (2016) 25718–25728
November

Taylor & Francis
Taylor & Francis Group

Heavy metals removal using iminodiacetate chelating resin by batch and column techniques

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Received 24 October 2015; Accepted 1 February 2016

ABSTRACT

Iminodiacetate chelating resin (IDAR) was prepared for removal of heavy metal ions from aqueous media. The prepared resin showed a powerful uptake behavior toward Cu(II), Ni(II), Hg(II), and Co(II). Different experimental parameters such as solution pH, metal ions concentration, contact time, and adsorption temperature were studied in batch method. The maximum adsorption capacity was found to be 1.79, 1.72, 0.96, and 1.26 mmol/g resin for Cu(II), Ni(II), Hg(II), and Co(II), respectively. The experimental data were analyzed by Langmuir, Freundlich, and Temkin isotherm models. Equilibrium studies showed that the data of metal ions adsorption followed the Langmuir model. Also, the kinetic and thermodynamic parameters of the adsorption process were estimated. These parameters showed that the adsorption process is spontaneous and followed the pseudo-second-order kinetics. Additionally, the removal of metal ions using (IDAR) chelating resin has been studied using column technique as well. Elution of chelating resin loaded with Cu(II), Ni(II), and Hg(II) was successfully performed with 0.2 M HNO_3 solutions and the resin could be reused for five sorption–desorption cycles with small loss of adsorption capacity. Co(II) was partially eluted under these conditions and penetrated throughout the length of the column.

Keywords: Chelating resin; Iminodiacetate; Kinetic models; Batch method; Column method; Heavy metal ions

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