

Selective removal of copper and cobalt from aqueous environment using new Cu(II) and Co(II) imprinted polymer and their determination by flame atomic absorption spectrophotometry

Behisht Ara^{a,*}, Mian Muhammad^b, Rani^b, Tanveer Ul Haq Zia^c, Kashif Gul^a

^aInstitute of Chemical Sciences, University of Peshawar, Khyber Pakhtunkhwa, Pakistan, emails: behishtara@uop.edu.pk (B. Ara), kashifpkh@uop.edu.pk (K. Gul)

^bDepartment of Chemistry, University of Malakand, Khyber Pakhtunkhwa, Pakistan, emails: mianchem@uom.edu.pk (M. Muhammad), uniquegirl730@yahoo.com (Rani)

^cDepartment of Chemistry, Sarhad University of Science and Technology, Khyber Pakhtunkhwa, Pakistan, email: tanveerics@gmail.com (T. Ul Haq Zia)

Received 12 May 2019; Accepted 20 February 2020

ABSTRACT

Imprinted polymers of Cu(II) and Co(II) were prepared for the removal of copper and cobalt ions from aqueous samples. Cu(II) and Co(II) ion-imprinted polymer were synthesized via precipitation polymerization method using functional monomer, 2-mercaptobenzimidazole, and divinylbenzene and 2-azobisisobutyronitrile as cross-linker and initiator, respectively. Non imprinted polymer was also synthesized in the same way except for the addition of template ions. It was found that ion-imprinted polymer shows greater affinity than the non-imprinted polymer. Various parameters were optimized for the preparation of Cu(II) and Co(II) ion-imprinted polymers such as pH and amount of crosslinker, monomer, and solvent. The polymers were characterized using scanning electron microscopy, Fourier transform infrared spectroscopy, and thermogravimetric analysis techniques. The kinetic and adsorption study shows that binding of Cu²⁺ and Co²⁺ follows pseudo-second-order kinetic and fitted best to the Freundlich isotherm respectively. The polymers were reused up to five cycles with RSD of 4.32% and 3.54% for Cu(II) and Co(II). Cu(II) and Co(II) ion-imprinted polymer were used for the removal of Cu²⁺ and Co²⁺ ions from various water samples.

Keywords: Ion imprinted polymers; Cu(II); Co(II); Divinyl benzene; 2-mercaptobenzimidazole

* Corresponding author.