

Incorporation of Ni(II)-dimethylglyoxime ion-imprinted polymer into electrospun polysulphone nanofibre for the determination of Ni(II) ions from aqueous samples

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Abstract

Ni(II)-dimethylglyoxime ion-imprinted polymer (Ni(II)-DMG IIP) was encapsulated in polysulphone and electrospun into nanofibres with diameters ranging from 406 to 854 nm. The structures of the Ni(II)-DMG encapsulated-IIP nanofibre, non-imprinted encapsulated-polymer nanofibre and polysulphone nanofibre mats were observed by scanning electron microscopy and evaluated by infrared spectroscopy. Electrospinning increased the specific surface area of the Ni(II)-DMG encapsulated-IIP nanofibre mats, as was evidenced by the low masses of the Ni(II)-DMG encapsulated-IIP nanofibre mats used. The accuracy of the method was validated by analysing a custom solution of certified reference material (SEP-3); the concentration of Ni(II) obtained was close to the certified one. The limit of detection was found to be $4.0 \times 10^{-4} \mu\text{g}\cdot\text{mL}^{-1}$ while the limit of quantification was found to be $1.2 \times 10^{-3} \mu\text{g}\cdot\text{mL}^{-1}$. The recovery of Ni(II) achieved using the Ni(II)-DMG imprinted nanofibre mats in water samples was found to range from 83 to 89%, while that of non-imprinted nanofibre mats was found to range from 59 to 65%, and that of polysulphone from 55 to 62%.

Keywords: electrospun encapsulated imprinted polymer nanofibres, aqueous samples, recovery