

Separation of nickel and cadmium from aqueous solutions by flow injection preconcentration onto cation functionalized polyurethane foam

ABSTRACT

A simultaneous spectrophotometric method was developed for the rapid determination of the binary elements nickel and cadmium. Two polyurethane foam sorbents, cation functionalized foam and untreated foam, were separately packed in two minicolumns and used for on-line preconcentration/separation. The two elements were separated/preconcentrated on the cation- foam minicolumn, and then they were eluted by hydrochloric acid and mixed with a thiocyanate stream before entering the untreated foam minicolumn. Nickel passed out to react with 4-(2-pyridylazo)-resorcinol reagent and measured spectrophotometrically at 498 nm. The adsorbed cadmium-thiocyanate on the untreated foam was further eluted by sodium hydroxide and identically detected. At a preconcentration time of 60 sec ($100 \mu\text{g L}^{-1}$), the detection limit was 4.6 and $3.3 \mu\text{g L}^{-1}$ and the quantification limit was 15.3 and $11.0 \mu\text{g L}^{-1}$ for cadmium and nickel, respectively. The preconcentration factor was 5.0 and 11.0, respectively, and sampling frequency was 12 and 20 h^{-1} . The accuracy was assessed using the BCR397R human hair and NIST 1577b bovine liver certified reference materials with a recovery of 92.0–94.2% (Relative standard deviation = 5.3–8.2%). The analysis of human urine and tap water samples demonstrated the applicability of the method and showed a relative recovery of 89.6 to 106% (Relative standard deviation $\leq 9.4\%$).