DETERMINATION OF RARE EARTH ELEMENTS IN WATERS BY INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION SPECTROMETRY AFTER PRECONCENTRATION WITH CHEMICALLY MODIFIED AMBERLITE XAD-4 RESIN

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Rare earth elements (REEs) are used in industrial applications due to their metallurgical, optical and electronic properties. The rising use of the REEs in industry, thus increasing the possibility of their release into the environment, has necessitated the development of new sensitive, precise and accurate analytical methods for their determination in various environmental matrices including water [1,2].

In this work, a new method has been developed for the determination of rare earth elements (REEs) (Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu) in water samples based on preconcentration with a mini-column packed with 6-(2-thienyl)-2-pyridinecarboxaldehyde functionalized Amberlite XAD-4 resin prior to their determination using inductively coupled plasma optical emission spectrometry (ICP-OES). The optimum experimental parameters for preconcentration of REEs, such as pH of the sample, sample and eluent flow rates and sample volume, have been investigated. The optimum pH values for quantitative sorption of the REE ions were between 6.0 and 8.0. The elution process was carried out using 2 mL of 1.0 mol L⁻¹ HNO₃ solution. Under the optimum conditions, detection limits between 0.032 and 0.963 µg L⁻¹ for a 10 mL sample volume and 0.006 and 0.193 µg L⁻¹ for a 50 mL sample volume were determined. The proposed method was successfully applied to the determination of REEs in water samples with recoveries in the range of 90.1–110.5 %.

KEYWORDS: Amberlite XAD-4, inductively coupled plasma optical emission spectrometry (ICP-OES), preconcentration, rare earth elements (REEs), waters, 6-(2-thienyl)-2-pyridine carboxaldehyde

REFERENCES: