

Graphene oxide based dispersive micro solid phase extraction for selective preconcentration of erbium from water samples and its determination by high-resolution continuum source electrothermal atomic absorption spectrometry

Sajjad Aghabala^{zadeh^{a,b}}, Mohammad Reza Ganjali^{a,c,*}, Parviz Norouzi^{a,c}

^aCenter of Excellence in Electrochemistry, School of Chemistry, College of Science, University of Tehran, Tehran, Iran, Tel. +98-21-88001318, email: s.aghabala^{zadeh}@ut.ac.ir (S. Aghabala^{zadeh}), ganjali@khayam.ut.ac.ir (M.R. Ganjali), norouzi@khayam.ut.ac.ir (P. Norouzi)

^bCinnaGen Medical Biotechnology Research Center, Alborz University of Medical Sciences, Karaj, Iran

^cBiosensor Research Center, Endocrinology and Metabolism Molecular-Cellular Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran

Received 22 July 2017; Accepted 23 March 2018

ABSTRACT

In this paper, graphene oxide nanosheets noncovalently functionalized with 3-hydroxy-N'-(1Z)-pyridin-2-ylmethylidene]naphthalene-2-carbohydrazide Schiff base were used as a dispersive solid phase adsorbent for the preconcentration of erbium from water samples followed by high-resolution continuum source electrothermal atomic absorption spectrometry determination. Fe_3O_4 microparticles were applied for magnetic separation of the adsorbent from water samples. The effect of various parameters including the Fe_3O_4 /graphene oxide ratio, pH of the sample, the amount of the sorbent, and the salt effect on the extraction efficiency of erbium was investigated. In the optimized conditions, the limit of detection and the limit of quantification were 6 ng L^{-1} and 20 ng L^{-1} respectively. The enrichment factor was 194, the relative standard deviation under optimal conditions was 3.3% for 500 ng L^{-1} ($n=6$) of Er. The calibration curve was linear up to 1.8 $\mu\text{g L}^{-1}$. The accuracy of the method was confirmed by analysis of certified reference solution of erbium. The proposed method was applied for the determination of ultratrace amounts of erbium in various water samples.

Keywords: Erbium; Dispersive micro solid phase extraction; Graphene oxide; Noncovalent functionalization; High-resolution continuum source electrothermal atomic absorption spectrometry

*Corresponding author.