

SIMULTANEOUS DETERMINATION OF TRACES OF Pt, Pd, Os, Ir, Rh, Ag AND Au BY USING MAGNETIC NANOPARTICLES SOLID PHASE EXTRACTION COUPLED WITH ICP OES.

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The direct analysis of these target analytes is very limited being essential sample pre-treatment techniques and the use of very sensitive instrumental techniques to carry out determinations. The inductively coupled plasma optical emission spectrometry shows a poor sensitivity because the concentration of some elements in environmental samples is below the detection limit of ICP OES. To solve this problem, preconcentration separation procedures have been proposed, minimizing the spectral and matrix interferences. Thus, enrichment is a very important issue for achievement of low detection limits [1-4].

In this study, a chelating resin 1,5 bis (di 2 pyridil) methylene thiocarbonohydrazide bonded to iron oxide magnetic nanoparticles (DPTH-MNPs) were synthesized. These magnetic nanoparticles were employed as a solid phase extraction (SPE) adsorbent for the separation and concentration of trace amounts of 7 elements (Au, Ag, Pd, Pt, Ir, Rh and Os) from environmental water samples. The main aim of this work was to develop a precise and accurate method for the simultaneous determination of the maximum possible number of elements by using this new adsorbent and a multimode sample introduction system (MSIS). The MSIS acts as a system for the generation, separation and introduction of chemical vapours (CVG) and also as an introduction system for sample aerosols, in a simultaneous form, into an inductively coupled plasma-optical emission spectrometer. The on-line SPE-CVG-ICP-OES system developed was applied in the determination of the aforementioned metals in natural water samples (sea water, estuarine, lake and river water), with the least demanding and simple sample preparation procedure. The developed method was validated by analysing natural water certified reference materials (TMDA 54.4 fortified lake waters and SRM 1643e, trace elements in water; and National Institute of Standards and Technology (NIST), NIST-2557 autocatalyst). Sea water, tap water and well water samples collected from Malaga (Spain) were also analysed. The procedure has been demonstrated to be fast, easy, automatic, selective and economical, and the sensitivity was good.

The main advantage of DPTH-MNPs is its very good stability and resistance because chemisorption of chelating molecules on the surface of solid supports provides immobility, mechanical stability and insolubility. The precision (RSD), accuracy (by standard addition or recovery) and limit of detection (LOD) were used to evaluate the characteristics of the procedure. Furthermore, the proposed method was applied in the simultaneous determination of the 7 elements mentioned above with a sample throughput of about 13 h⁻¹, thereby, reducing the time of analysis and the volume of reagents and sample required.

References

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