SEQUENTIAL DETERMINATION OF HEAVY METALS IN ENVIRONMENTAL WATER SAMPLES BY FLOW INJECTION-CHEMICAL VAPOUR GENERATION-INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY

I. Sánchez, A. García*, E. I. Vereda and J. M. Cano

Department of Analytical Chemistry, Faculty of Sciences, University of Málaga, Campus of Teatinos, 29071 Málaga, Spain; Fax: +34 952132000; Tfno: +34 952131885; email: agarciad@uma.es

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The toxicity of "heavy metals" has been well recognized for a long time. Often the non-specific term "heavy metals" is used for three of the metals, cadmium, mercury and lead. These have large bioconcentration factors in marine organism, are highly toxic and, unlike many of the transition elements have no known natural biological functions. For these reasons these metals generate the greatest concern for the general public and therefore also for environmental agencies in the majority of states. The monitoring and control of these trace elements in the environment requires powerful analytical methods to accurately characterize their abundance and to reach reliable conclusions. In this work, an inductively coupled plasma mass spectrometry (ICP-MS) method has been developed for the sequential determination of Pb, Cd and Hg in natural waters, including sea-water, using an on-line preconcentration flow injection chemical vapour generation system (FI-CVG). It is difficult to simultaneously determine these elements by CVG, because their conditions of CVG are different. Thus, the system was based on the use of two minicolumns packed with 1-(di-2-pyridyl)methylene thiocarbonohydrazide chelating resin which were placed in two injection valves of a simple flow manifold to be loaded simultaneously. A third valve was arranged to select the reagent for the selective vapour generation of the analytes and, thus make possible the sequential determination of the three metals. By using this device, diverse advantages are attained: increase of the sensitivity and reduction of the interferences by the preconcentration and the vapour generation. The detection limits achieved (3 min sample loading time) were: 9, 17 and 12 ngL^{-1} for Pb, Cd and Hg, respectively, with a sample throughput about 10.4 h^{-1}. The accuracy of the proposed method was checked with three certified reference materials (CRMs): TMDA-54.4 fortified lake water, LGC6016 estuarine water and CASS-5 oceanic water and the results obtained were in good agreement with the certified values. The method was also applied to the determination of Pb, Cd and Hg in different sea-water samples from the Málaga Bay.