DETERMINATION OF TRACE METALS IN SEA WATERS OF THE ALBANIAN COAST BY ENERGY-DISPERSIVE X-RAY FLUORESCENCE

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Preconcentration of trace transition and heavy metal ions by precipitation with APDC has been combined with energy-dispersive X-ray fluorescence for environmental sea water analysis. The preconcentration procedure implies adding of 500 μg Mo ion and 10 ml of 1% water solution of APDC to a 500 ml water sample at pH 4, filtering off on a Millipore filter and analyzing after drying. Realistic detection limits are at 1 μg.l⁻¹ level and precision varies between 10-25% at about 5 μg.l⁻¹ level, depending on the element. Eleven sea water samples, covering Albanian Adriatic and Ionian coast, are analyzed for trace metal ions.

INTRODUCTION

Most of the properties and processes taking place in sea water are directly affected by its chemical composition. Large number of elements, ranging in concentration through 14 orders of magnitude, are present in sea
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The concentrations of these elements are so low that multielemental analytical techniques usually require a prior concentration step which ideally enriches the transition and heavy metal ions exclusively and efficiently, while leaving the abundant alkali and alkaline earth ions in solution. Van Grieken² made a general description and critical evaluation of the procedures for multielement preconcentration of trace elements prior to X-ray fluorescence analysis of water. Among the described procedures we selected for our work the precipitation of trace metal ions with a nonspecific organic reagent and subsequent collection of the precipitate on a filter. This results in a strongly enriched uniform sample of low atomic number matrix that can be directly presented to X-ray fluorescence system and guarantees analysis with optimal sensitivities and minimal matrix effects.

In view of the low aqueous solubility of their metal chelates, the dithiocarbamates have been widely used as precipitating reagents. Ammonium-pyrrolidine-dithiocarbamate (APDC) is one of the most preferred. It forms chelates of low water solubility with a great number of metal ions, which are stable even at concentrations below 10 µg l⁻¹ and their recovery is not affected by the alkali and alkaline earth ion contents³-⁵.

It was because of these characteristics and the simplicity of the procedure that we used APDC for the analysis of trace metal ions in sea water. To improve the precipitation characteristics, we used the coprecipitation technique by adding Mo ion as a carrier.