SENSITIVE DETERMINATION OF ANTIMONY TRACES IN PET BOTTLED WATERS BY ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY AFTER SOLID PHASE EXTRACTION

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Antimony (Sb) is a potentially toxic trace element listed as a priority pollutant by the US EPA, the EU, and the German Research Foundation. It is widely used in industrial applications among which the manufacturing of plastics. As a result, concern has been raised with regards to the potential release of Sb traces in PET bottled liquids like water, fruits juices, etc. [1,2]. Although various techniques may be used for the determination of Sb, its presence in laboratory plastics complicates the determination at ultra trace levels due to unknown blank effects. As a result clean lab methods and highly sophisticated detectors like ICP-MS are required for the determination of Sb in natural waters [1,3]. Nevertheless, the cost involved in the application of these methods for routine screening of water quality is high.

In this work a new method for the determination of Sb in natural waters is described. The method is based on the complexation of Sb with ammonium pyrrolidinedithiocarbamate (APDC) which is then isolated from the bulk aqueous phase using solid phase extraction. Various sorbent materials like XAD-4, XAD-7, Amberlite IR-120plus, activated carbon and C18 were examined for their ability to extract the hydrophobic Sb-APDC chelate. Evidently, high background signals were observed for most sorbents which were attributed to Sb contamination. Although sorbent clean up was extensively performed prior to each analysis, reproducibility could not be improved to acceptable levels except for end-capped C18 material. Under the optimum conditions the determination of Sb was achieved at concentrations as low as 0.32 µg/L by simply preconcentrating 10 mL of sample volume. Due to the low abundance of Sb, the method of standard additions was found to be necessary in order to enable its determination in commercial bottled waters.

Preliminary results from commercial bottled waters show concentrations below 1µg/L for all samples analyzed with concentrations ranging from 0.26-0.80 µg/L suggesting no violation of the current legislation in force. However, given that there appears to be a continual release of Sb from the containers to the fluids as a function of the duration of storage [1], systematic studies of the extent and intensity of contamination are warranted.