DETERMINATION OF TRACE HEAVY METALS BY FLAME ATOMIC ABSORPTION SPECTROMETRY AFTER SOLVENT EXTRACTION

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Flame atomic absorption spectrometry (FAAS) has been particularly used in the determination of trace metals because of its high specificity. Due to the limitations of detectability by FAAS, preconcentration of trace metals is required. Solvent extraction is of great value in preconcentration of trace metals as it is a simple, rapid, easy method and eliminates matrix effects.

One of the best complexing agents for metal ions is N,N-diethyl-N'-benzoylthiourea (DEBT) which is capable of pH-selective complexation and enrichment of metal ions by solvent extraction.

Up to now, metal complexes of DEBT have not been used in the quantitative determination of trace metal ions by atomic absorption spectrometry. In this work, the experimental conditions for the determination of Cu(II), Co(II), Fe(III) and Mn(II) ions as the metal chelates of DEBT after solvent extraction with methyl isobutyl ketone (MIBK) by FAAS have been optimized.

Standard solutions in which metal concentrations ranging from 1 μg/L to 20 μg/L were prepared from the salts of metals. After the pH adjustment metal-DEBT complexes were prepared and extracted to MIBK and then analyzed by FAAS.

The stability of the metal complexes extracted in MIBK was controlled and the extraction period was optimized as 1 min. The precision was characterized by ten replicate analyses of the mixed solution of the four metals taken in equal amounts. The results were found to change from 5 to 10% RSD for 5 μg/L metal ion. The recovery of metals was found by extracting standard samples successively under similar conditions. The results show that the extraction efficiency is better than 95% upto a concentration of 500 μg/L for Cu, Co, Fe and Mn. The detection limits (3σ) were evaluated for a concentration of 0.50 μg/L for each metal. The results obtained were better than 0.2 μg/L.

The stable metal complexes of DEBT were successfully extracted with MIBK. The presented method enables the analysis of real analytical samples such as biological materials, water and food samples. The interference effects of foreign ions is also going to be studied.

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