Flow Injection On-Line Metal Preconcentration Using a PTFE-Turnings Packed Column for Nickel and Zinc Determination by Flame Atomic Absorption Spectrometry

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Flame atomic absorption spectrometry (FAAS) is one of the most extensively used techniques with significant sensitivity and selectivity. However, very low analyte concentration and/or matrix interferences usually cause difficulties in the direct measurement of the analyte. The coupling of flow injection (FI) on-line column preconcentration/separation techniques to FAAS has proved to be effective in this case. Chemical and mechanical properties of the sorbent material, affects significantly the effective sorption and elution of the analyte. Various packing materials have been used for heavy metals determination in various types of matrices, like: ion-exchange resins, C18, polystyrene-divinylbenzen polymer, polyurethane foam and polytetrafluoroethylene polymer (PTFE). PTFE as sorbent material in the form of turnings has been introduced for the first time in 2001 from our research group, for Cu determination [1]. The beneficial use of this novel form of PTFE as sorbent material was already demonstrated for on-line preconcentration and determination of Cr, Pb, Co, As and Hg by atomic absorption spectrometry [2 – 3].

In the present work PTFE-turnings was applied, as packing material for flow injection on-line column preconcentration and separation systems coupled with flame atomic absorption spectrometry (FAAS). The performance characteristics of the proposed manifold were evaluated for trace nickel and zinc determination. The metal-complexes with ammonium pyrrolidine dithiocarbamate (APDC) were formed on-line and adsorbed on the surface of PTFE-turnings. Isobutyl methyl ketone (IBMK) was used to elute the analyte chelation directly into the nebulizer-burner system of FAAS. All main factors affecting the adsorption and elution were examined thoroughly. The proposed sorbent material reveal, unlimited life time, fast adsorption kinetics permitting the use of high sample flow rates without loss of retention efficiency. The developed method was applied for on-line metal determination in environmental samples and certified reference materials.

References