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Graphite filter furnace atomizer as effective tool for direct atomic absorption analysis of some biological materials

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It is well known that electrothermal atomic absorption spectrophotometry (ETAAS) are widely used for the determination of the total trace elements concentration in various biological samples. However, at these several drawbacks, especially its macro components interference effect on the atomic absorption value of the elements to be determined, as well as non-specific absorbance of light, must be taken into account. In recent years not only Stabilized Temperature Platform Furnace (STPF) technique for elimination of a number of interferences, but graphite filter furnace (FF) atomizer has been shown to be a very powerful tool for quantitation of Pb, Cd and Cu in organic-based materials. Unfortunately, in analytical practice of toxicological, medical and other corresponding laboratories for ETAAS analysis of serum, whole blood, urine and other biologicals this device are not practically used.

The goal of this work has been to develop a procedure for the direct ETAAS determination of Pb, Cd, Mn, Cu, Zn and Se in some of biological materials using graphite filter furnace (FF) atomizer.

In operation parameters of program heating FF atomizer there was established the detection limit, interference effect from mineral and organic components of biological materials and corresponding background signal, including evaporation in the presence of some chemical modifiers (CM).

The graphite FF atomizer with CM is an effective application for the direct ETAAS determination of Pb, Cd, Mn, Cu, Zn and Se in blood, urine and saliva samples. This method can be used instead of other methods that require laborious and time-consuming procedure of sample preparation.

The FF atomizer provide ~ 2 – 2.5 fold increasing in sensitivity for the ETAAS determination of listed elements in comparison with a graphite platform as well as significant removal of some interference effects including background absorption.

The proposed method can be used for the determination of ≥ 0.0015 , 0.0002, 0.0003, 0.0008, 0.0002 and 0.0020 ppm of Pb, Cd, Mn, Cu, Zn and Se, respectively, in blood, urine and saliva.

It was established that concentrations of listed elements in analyzed biological fluids varied between 0.00025 and 0.075 $\mu\text{g}\cdot\text{g}^{-1}$. The results prove that the determined concentration of Pb, Cd, Mn, Cu, Zn and Se in these biologicals are in accordance with the reference values in literature. The time of one element determination does not exceed 7 min with S_r 6 %.