CONTROL OVER METAL CONTENT BY A HIGH-SENSITIVITY NUCLEAR-ABSORBTION METHOD

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Important quality merits of synthetic and natural products safety is the presence and concentration of metals in them such as product, technological and toxic. Metal content control in production and operational environments is an important task in hydrometallurgy and geology, different chemical productions, atomic equipment and power industry, food industry, agrochemistry, ecology, medicine, biology etc. Metal control content can be performed by nuclear-spectral (absorbtion, emission, fluorescent), polarographic and other methods, among which the most common is the nuclar-ansorbtion method (NA).

Metrological grounds of AA spectrometerts' metrology and unity of AA measurements are determined by a physical essence of measured values, reproduction methods of alues' units and rendition of their dimensions. [1]. The main metrological characteristics of AA spectrometers are characteristical mass (concentration) and the detection limit.

The new method of the high-sensitivity AA control is based on the concept of rapid furnace heating (RFH), [2]. At heating speeds of 10 K ms-1, the processes of atomization dissipation of a nuclear steam are divided temporally. In a sequential flow of these processes in small and light longitudinally heated graphite furnace length of about 2cm in diameter, cross-sectional analysis zone 4mm atomic vapor samples over a finite period of time is localized in the analytical volume of the furnace. The amplitude of the resulting signal is determined by the total number of atoms of the analyte in the furnace, spectral characteristics of absorbing and emitting layers, geometry of an analytical zone and does not depend on the kinetics of evaporation and residence time of atoms in the volume of the furnace. As an informative parameter, the amplitude of the pulse signal A (t) atomic absorption is used, which is uniquely related to the number N (t) of atoms of the analyte in the analytical cell. As a result, a high sensitivity is provided, allowing to reliably determine nanoconcentration of elements.

In rapid heating of the furnace under the transformation N (T) A (T) the amplitude of the signal absorption does not depend on the time $_1$ of atomization and on the time $_2$ of presense of free atoms in the analytical volume. The above, also as a distinctive feature of the method of the RFH, minimizes the impact on the basis of sample inspection results and allows calibrating the spectrometers with inadequate standards or using the reference-free method of measurement.

AA spectrometer with electrothermal atomization QUANT - Z. ETA, was created on the basis of concept of BNP, and produced RPE "Kortek" (Moscow), Russia RU.S.31.003.A certificate number 1957.

Minimum concentrations determined by QUANT - Z. ETA, lie in the range of 0,001 ÷ 0,1 mg / l or 1 ÷ 100 ng / l, ie nanoconcemtrations. The method of electrothermal AA – RFH with amplitude recording and method of parallel averaging of results made it possible to increase sensitivity and decrease the level of minimal concentrations determination of elements approximately twice in comparison with modern ETAA spectrometers available at the world market.