VALIDATION OF CADMIUM DETERMINATION IN POLYETHYLENE REFERENCE MATERIALS BY MEANS OF SOLID SAMPLING ZEEMAN ATOMIC ABSORPTION SPECTROMETRY

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Cadmium is widely used in the industry as additive in paint, stabilizer for plastic materials against ageing and heat effect, or for plating metal surfaces and preventing corrosion. On the other hand, it is a pollutant of high toxicity; therefore a strict analytical control on cadmium content is needed.

The dissolution of polyethylene requires complex and time consuming procedure involving either concentrated acids and heating or toxic organic solvents. Because of the high volatility of cadmium there is a risk of analyte losses by methods using wet digestion in sample preparation.

Direct solid sampling Zeeman atomic absorption spectrometry (SS-ZAAS) with no chemical sample preparation reduces to minimum the risk of contamination and analyte loss. The short analysis cycle after calibration delivers one result every 3 minutes and avoiding any dilution step the method achieves lower detection limits than conventional wet-digestion AAS-techniques.

Direct SS-ZAAS method was developed and applied to the determination of cadmium in polyethylene. Measurements were performed by a third generation solid sampling Zeeman atomic absorption spectrometer ZEEnit 60 from Analytik Jena, Germany. The magnetic-3-field-measurement mode extended the linear range of the calibration up to three orders of magnitude. High amounts of analyte were detectable without laborious dilution of solid samples.

The use of solid certified reference materials (CRMs) as calibration standards allowed simple calibration and modifier-free determination of cadmium in polyethylene CRMs resulting in high accuracy of the measurements. It was proved that SS-ZAAS is a rapid and accurate method for the determination of cadmium in polyethylene. The metrological characteristics of the method and its possibilities for certification of reference materials were discussed.