

Consolidation of equivalence between EDXRF and GF-AAS analytical techniques for particulate matter on filter samples

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The aim of this study is to examine the correlation of metal analyses from two different methods and to investigate the equivalency of the two methods. Two analytical methods GF-AAS and ED-XRF were used for the determination of the concentration of As, Cd, Ni, Cu and Pb in PM₁₀ fraction by technique. The results indicate the existence of equivalency between the techniques for Pb, Ni, Cu and As while it is impossible to draw any conclusions about Cd.

The samples used, were collected from different background areas (urban, industrial).

The samples were cut in two parts. One part was used for the determination of metals by means of Electrothermal Atomic Absorption Spectroscopy and the other part was analysed by X-Ray Fluorescence for the same elements.

The AAS instrument used, was a Varian 220 spectrometer equipped with a GTA 110 graphite furnace. Hollow cathode lamps were used as radiation sources for all elements. ET-AAS conditions were carefully optimized for the compensation or elimination of interferences (Karanasiou et al. 2005). As far as the ED-XRF instrument is concerned a secondary target-XRF spectrometer was used, which consists of a side-window low power X-ray tube with a W anode (spot size 1.8-2.1cm, 100kV max voltage, 6mA current, 600 W maximum power consumption). The characteristic X-rays emitted from the sample are detected by a Ge X-ray detector (PAN-32, with 140 eV FWHM at MnK α , 30mm² and 5 mm thick Ge crystal with 8 μ m Be window).

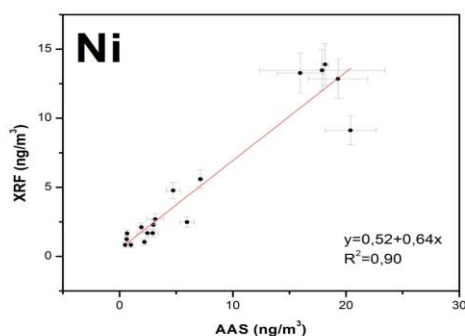


Figure 1: Correlations between the analyses using two techniques for Nickel.

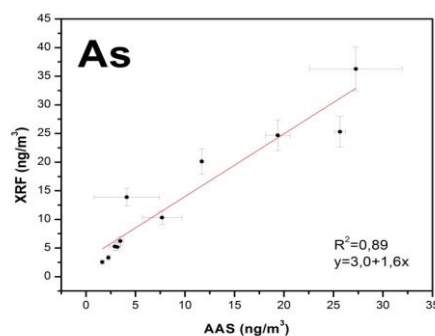


Figure 2: Correlations between the analyses using two techniques for Arsenic.

The correlation between the results of both techniques is very good for Pb, Cu, Ni and As. For Cd it was not possible to investigate the correlation, as there was no value above detectable limits for the XRF technique. The results of the comparison are similar to those mentioned in the technical report EN 24983.

Karanasiou, A.A., Thomaidis, N.S., Eleftheriadis, K., Siskos, P.A., 2005. Comparative study of pretreatment methods for the determination of metals in atmospheric aerosol by electrothermal atomic absorption spectrometry. *Talanta* 65, 1196–202. doi:10.1016/j.talanta.2004.08.044

EN24983. Evaluation of EDXRF for the Determination of Elements in PM10 Filters; 2011