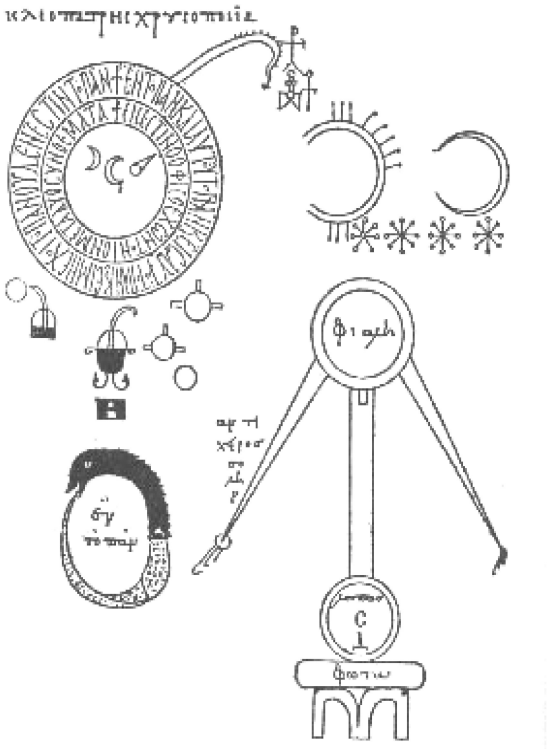
PLENARY LECTURES



Influence of the Measurement Time on Signal, Noise and Background in Radioisotope X-Ray Fluorescence Spectrometry

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The main advantages of the application of energy dispersive x-ray fluorescence spectrometry (EDXRF) with radioisotope excitation sources in qualitative and quantitative chemical analysis are the non-destruction of the sample, the great depth of information, the accuracy of analysis, the simple operability, and the economic efficiency. One of the important operating EDXRF parameters that most influences the productivity is the measurement time. In order to optimize the measurement time, twelve spectra (see Fig. 1) resulted from varying the measurement time were used in this work to study the signal, noise, and background changes in EDXRF.
The measurements were performed with a Canberra EDXRF system at the Vinča Institute of nuclear sciences. This system consisted of a lithium drifted silicon (Si(Li)) detector, annular ^{109}Cd excitation source, and a multi-channel analyzer. The collected spectra were transferred to a PC computer and analyzed. An amount of 200 mg of NIST 1633b coal fly ash certified reference material was irradiated and measured for different measurement time ranging from 60 to 345600 s.
In each spectrum, eighteen elements (K, Ca, Ti, Cr, Mn, Fe, Cu, Ni, Zn, Ga, Ge, Pb, Se, As, Rb, Sr, Nb, Zr) were identified and their peak areas determined. The signal values linearly increased for all elements, except for Fe where the signal saturation occurred at about 170000 s. However, after an initial increase and reaching a maximum at approximately 6000 s, the signal-to-background ratio for most elements decreased and approached a constant value at longer measurement time. In the event of Fe, a different behavior showing a continuous decrease was observed. The signal-to-noise ratio seems to be a linear function of the measurement time in the studied range.

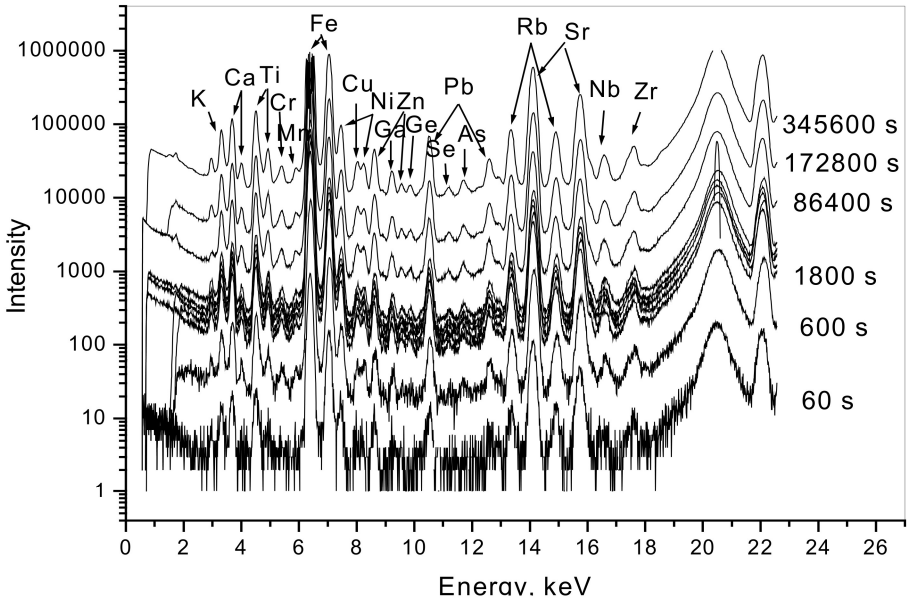

Fig. 1. EDXRF spectra of NIST 1633b coal fly ash sample as a function of the measurement time.