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MULTIELEMENTAL ANALYSIS OF AEROSOL SAMPLES WITH PIXE IN COMBINATION WITH COMPLEMENTARY NUCLEAR TECHNIQUES

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During the last decade a new analytical method, Particle Induced X-ray Emission Analysis (PIXE), has been developed. The method has been extensively applied to aerosol studies. The capability of the method for reliable multielemental analysis with low detection limits (10^{-9} - 10^{-12} g) for several elements of interest, has been attractive. The possibility to analyse small samples ($\sim 10^{-6}$ g) has given opportunities for using small and low-weight equipment for size- and/or time-fractionated sampling.

In PIXE-analysis the samples are bombarded with ions from an accelerator and the emitted characteristic X-rays are detected with an energy-dispersiv semiconductor detector. The energy of the characteristic X-rays decreases with decreasing atomic number of the elements. For the lightest elements (LI, Be, B, C, N, O, F, Mg, Al, Si and P) either the X-ray energy is too low for detection or the attenuation of the X-ray intensity in a thin aerosol sample significantly increases the uncertainty of the analysis.

However, complementary nuclear techniques may be used to determine the light elements. Particle Elastic Scattering analysis (PESA) and detection of radiation from particle-induced nuclear reactions are two techniques which can bee exploited. Sometimes the complementary techniques may be performed simultaneously with the PIXE-analysis.

For optimum use of PIXE and complementary methods the sampling technique and the choice of sampling substrate as well as the analysis parameters should be considered. The potential of PIXE and complementary methods will be discussed and examples of applications of the combination sampling technique, PIXE analysis and complementary techniques will be given.