

## **Multielemental characterization of industrial wastes and soils by ion beam analysis techniques**

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Trace and toxic elements present in industrial waste materials and soils negatively affect the environment and ecosystems health and, for their quantification, high precision analytical techniques should be employed.

In this paper two ion beam techniques, Particle Induced X-Ray Emission (PIXE) and Particle Induced Gamma-ray Emission (PIGE), were used in combination for the determination of total concentrations of several major, minor and trace elements in various industrial wastes and soils located around chemical and metallurgical industry in Romania.

Thick target PIXE and PIGE were applied at the 3 MV Tandetron at Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH), Romania, using a 3 MeV proton beam as projectile particles. The elements determined by PIXE were: Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Br, Rb, Sr, Ag and Pb. In the case of PIGE, the elements of interest F, Na, Mg, Al, Si, Mn and Fe were determined based on the nuclear reaction of (p,p'γ) type of the protons "p" on the target samples, as well as on the (p,nγ) type reaction in the case of Mn.

The non-destructive multielemental techniques proved to be very useful for the waste management and hazards monitoring in environment and identification of a large series of trace elements in environmental complex studies, some of them being toxic for living organisms and humans and others contributing to the elemental cycling in natural environments.

The obtained results will complete the compositional schemes obtained by using X-ray fluorescence (Genius XRF spectrometer, Skyray Instruments Inc.) for the investigated materials at INPOLDE interdisciplinary international research center of "Dunarea de Jos" University of Galati (UDJG), Romania.