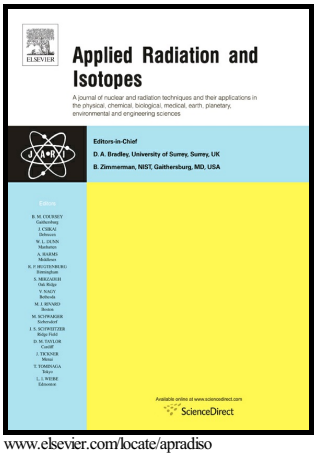

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M.S. Rihawy, I.M. Ismail, D. Halloum

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Setting up of in-vacuum PIXE system for direct elemental analysis of thick solid environmental samples

M. S. Rihawy [a, *], I. M. Ismail [a], D. Halloum [a]

[a] Department of Chemistry, Atomic Energy Commission, P.O. Box 6091, Damascus, Syrian Arab Republic

[*] Corresponding Author. Tel: +963 11 2132580, Fax: +963 11 6112289, Email address: cscientific4@aec.org.sy

Abstract

Experimental set-up, development, characterization, and calibration of an in-vacuum PIXE system at the tandem accelerator facility of the Atomic Energy Commission of Syria (AECS) is described. The PIXE system calibration involved experimental characterization of the X-ray detector parameters and careful determination of the H-values that control dependence of the detector solid angle with the X-ray energies and correct imperfect values of the detector efficiency. Setting up of an electron flood gun to compensate charge built up and utilization of a beam profile monitor to perform indirect measurement of the beam charge, provide a direct PIXE measurement of thick insulating samples in-vacuum. The PIXE system has been subsequently examined to verify its ability to perform direct PIXE measurements on geological materials. A combination of minimum sample preparation procedures and specific experimental conditions applied enables simple and accurate elemental analysis. Elemental concentrations of several elements heavier than sodium in different reference geological samples, at about 5-10% absolute accuracy for most elements, have been determined. Comprehensive discussion of the obtained elemental concentration values, for most elements of visible X-ray peaks in the PIXE spectra, has been considered.

Key words: TTPIXE, elemental analysis, environmental samples, ion beam analysis