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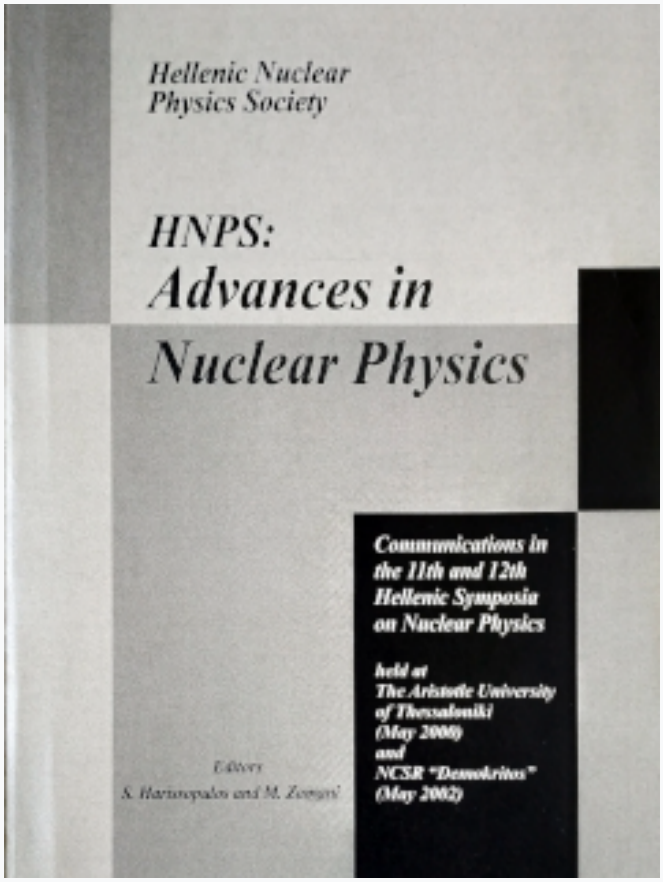

X-Ray spectrometric studies using thin silicon crystals. Advantages and applications

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X-Ray spectrometric studies using thin silicon crystals. Advantages and applications

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Abstract

This paper presents the peak-to-background ratio improvement, which can be achieved in PIXE and XRF applications by the use of thin crystal detectors. This improvement becomes apparent in the presence of an intense γ-ray source, which can be produced either after proton irradiation of a sample (PIXE), or after the deexcitation of the radionuclide in Radioisotope induced XRF analysis (RIXRF). In order to study theoretically the energy response of a silicon crystal in the X-ray energy region with respect to its thickness and the energy of the incident γ-radiation, a Monte-Carlo simulation was performed. Experimentally, two detectors having crystal thickness of 300 μm and 3 mm respectively were employed in specific analytical applications of PIXE, PIXE induced XRF and RIXRF techniques. The peak-to-background ratios obtained for various characteristic X-rays were compared between the two detectors. The performance of the two detectors was also compared in monochromatic XRF analysis of samples with low average atomic number matrix content.