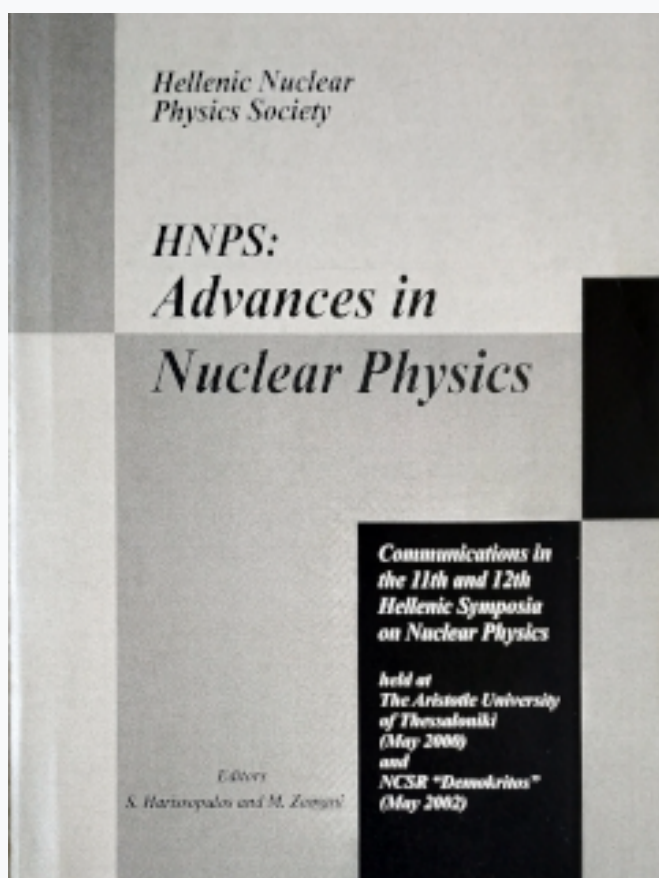


HNPS Advances in Nuclear Physics

Vol 11 (2002)

HNPS2000 and HNPS2002



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

A. G. Karydas, Ch. Zarkadas, A. Kyriakis, J. Pantazis, A. Huber, R. Redus, C. Potiriadis, T. Paradellis

doi: [10.12681/hnps.2234](https://doi.org/10.12681/hnps.2234)

To cite this article:

Karydas, A. G., Zarkadas, C., Kyriakis, A., Pantazis, J., Huber, A., Redus, R., Potiriadis, C., & Paradellis, T. (2019). X-Ray spectrometric studies using thin silicon crystals. Advantages and applications. *HNPS Advances in Nuclear Physics*, 11. <https://doi.org/10.12681/hnps.2234>

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

**A.G. Karydas^a, Ch. Zarkadas^a, A. Kyriakis^a, J. Pantazis^b, A. Huber^b, R.Redus^b
C. Potiriadis^c and T. Paradellis^a**

*^a Laboratory for Material Analysis, Institute of Nuclear Physics,
NCSR "Demokritos", Aghia Paraskevi, 153 10 Athens, Greece*

^b Amptek, Inc., 6 De Angelo Drive, Bedford, Mass. 01730 U.S.A.

^c Greek Atomic Energy Commission, Aghia Paraskevi, 153 10 Athens, Greece

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.