

Use of a silicon drift detector (SDD) in the quantitative analysis of in-air PIXE

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Abstract

In the present study, we used a silicon drift detector (SDD) for the quantitative analysis of in-air PIXE. First, we examined the basic performances of the detector. We found that the shift of the peak position was less than 0.45 eV, and the energy resolution was 130-136 eV at 5.98 keV. We then used the SDD for a quantitative analysis. Physical parameters, such as the X-ray production cross sections, values of the transmission of X-rays through absorbers and the detection efficiencies, which are required for quantification, were obtained theoretically and experimentally. We confirmed that many elements, from magnesium to barium, were able to be detected without using any special device. The results of the quantitative analyses of a few standard materials showed good agreement with the certified values. This method was also used to analyze practical samples, including bio-medical samples, and the results were in good agreement with the results obtained with in-vacuum PIXE.