

Energy Response of Aurum-Silicon Surface Barrier Detector to Kr and Xe Ions

Huang Zhisheng

Northwest Institution of Nuclear Technology, Xi'an 710024, China

Abstract

The use of aurum-silicon surface barrier detector (SSBD) for the measurement of the energy of fission fragments is inaccurate by the effects of significant pulse-height defect (PHD) phenomena. Three contributions to the total PHD for the detectors, these are the window defect (E_w), due to the loss of energy in the front gold electrode, the non-ionization energy defect (E_n), due to the loss of energy by end of range non-ionizing atomic collisions, and the recombination defect (E_r), due to the recombination of non-equilibrium electron-hole pairs in the ionizing particle's track. A SSBD is used for the measurement of the energy of the Kr\Xe beams provided by Low Energy intense-highly-charged ion Accelerator Facility (LEAF) to study the energy response of heavy ions, and the three contributions are determinant by experiments and simulations. The results indicate that the recombination defect increases with the higher energy for the same particles, and the larger number of charges lead to the more recombination defect for the particles with similar energy. The linear relationship of the energy response between the 5.486 MeV of α particle and the 80 MeV of Xe ions ultimately is good after the correction of the three contributions.

Keywords: Aurum-silicon surface barrier detector; Heavy ions; Pulse-height defect; Energy response