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Radiation resistance of SiC detectors under neutron irradiation

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The results of an investigation of silicon carbide (SiC) detectors when irradiated with neutrons are presented. SiC detectors were manufactured on the basis of the epitaxial layer of 4H-SiC n-type conductivity. The thickness of n-type epitaxial layer was 50 μm. Schottky barrier contacts with a diameter of 3.0 mm were made by vacuum evaporation of a double layer of Ni and Au 10 and 30 nm thick. The initial energy resolution of detectors was < 25 keV for α-particles.
The radiation resistance of SiC detectors was studied experimentally by analyzing their characteristics before and after fast neutron irradiation with integral fluxes of 5.1x10ˆ13, 5.4x10ˆ14, 3.4x10ˆ15 n/cm2. The irradiation was carried out at the pulse reactor IBR-2M (JINR, Dubna). The α-source 226Ra (E = 4.8, 5.5, 6.0, 7.7 MeV) that was used for calibration and control of spectrometric characteristics of SiC detectors.
It is shown that after neutron irradiation, significant degradation was observed: the peaks from the alpha particles shifted towards smaller channels and became much wider; with an increase in the flux, the energy resolution degrades by two, ten and twenty times; the charge collection efficiency (CCE) decreased from 100% to 96%, 70% and 1% (operating voltage 350 V) at the neutron irradiation fluxes of 5.1x10ˆ13, 5.4x10ˆ14, 3.4x10ˆ15 n/cm2, respectively.

The speaker is a student or young scientist

No

Section

1. Applications of nuclear methods in science and technology

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