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Effect of 1 MeV neutron-irradiation on the electrical properties of Si-based diodes.

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The impact of radiation on Si-based detectors has garnered interest due to the observed degradation in their stability in high-radiation environments. In this study, we examined the effects of 1 MeV neutron-irradiation at different fluences on the electrical properties of undoped n-Si diodes using current-voltage (I-V) technique. The irradiation fluences ranged from 0 to 1017 n/cm2. The obtained results indicated that the diodes were well fabricated, and neutron-irradiation resulted in a diode behaviour changing from normal exponential to ohmic I–V behaviour. This ohmic behaviour was explained in terms of irradiation-induced defect levels that were positioned at the centre of the energy gap. An I–V ohmic region increased with fluence indicating that the density of defect levels has increased with neutron-irradiation fluence. A change in diode conduction mechanism domination and parameters with different radiation fluence were also investigated. The obtained I–V properties of neutron-irradiated Si-based diodes were similar to those of the diodes that were fabricated on radiation-hard materials, indicating that neutron-irradiation at certain fluences improve radiation-hardness of Si to be used in high energy physics experiments.

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