Contribution ID: **43** Type: **WG6 - Wide bandgap materials**

Characterization by IBIC of neutron irradiated SiC detectors at CNA

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SiC is among the most promising materials for use in detectors operating under extreme radiation and temperature conditions. For these applications, the replacement of the front electrode with a graphene layer could represent a significant improvement due to the thermal and electronic properties of this novel material. As a first approach, the Barcelona Institute of Microelectronics has developed 50 microns thick SiC PN diodes where the front metal electrode has been deposited only on the periphery of the detector.In this study, both pristine and neutron-irradiated SiC detectors, have been characterized at the National Accelerator Center (CNA, Seville) using a triple alpha source and the Angular-Resolved Ion Beam Induced Charge (AR-IBIC) technique with a 2.7 MeV focused proton beam.

One of the most significant features of the detector irradiated to the fluence of $1x10^{15} n_{eq}/cm^2$ is that it operates in both reverse and forward voltage. The measurements of the Charge Collection Efficiency (CCE) obtained with the triple alpha source, whose ranges in SiC are between 16 and 20 microns, indicate an important decrease in the CCE compared to the pristine detector for both polarities. On the contrary, the AR-IBIC experiments carried out with 2.7 MeV protons, whose range is similar to the nominal thickness of the diode, reveal a significant enhancement in the signal under forward bias for low incident angles, with CCE values exceeding 100%. This behavior suggests the presence of gain mechanisms, likely induced by irradiation-induced defects, which enhance carrier multiplication. These findings are consistent with recent measurements obtained using the Two Photon Absorption-Transient Current Technique (TPA-TCT) conducted at IFCA.

Type of presentation (in-person/online)

online presentation (zoom)

Type of presentation (I. scientific results or II. project proposal)

I. Presentation on scientific results

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