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Radiation Hardness of n-type SiC Schottky Diodes

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The results of recent IBIC and DLTS studies of radiation damage in silicon carbide (SiC) diodes will be presented. n-type Schottky diodes prepared on an epitaxial grown 4H-SiC thin wafers have been irradiated by a raster scanned alpha particle microbeam (2 & 4 MeV He2+ ions separately) in order to create patterned damage structures at different depths within sensitive volume of tested diodes suitable for Ion Beam Induced Current (IBIC) microscopy. Deep level transient spectroscopy (DLTS) was used to characterize defects created in SiC after implantation of single alpha particles. Robust and proven IBIC experimental protocol [1] has been used to determine a degradation of the charge collection efficiency over a wide fluence range of damaging alpha particle. The radiation hardness of these SiC wafers is compared with the hardness of n-type silicon wafers grown by the Floating zone and Czochralski methods obtained by the same experimental protocol. A suitability of as prepared SiC diodes for the light ion detection and spectroscopy in the MeV range will be discussed from the perspective of applications in harsh radiation environments.

[1] Z. Pastuovic, E. Vittone, I. Capan, M. Jaksic. Probability of divacancy trap production in silicon diodes exposed to focused ion beam irradiation, Appl. Phys. Lett. 98 (2011) 092101. http://dx.doi.org/10.1063/1.3559000

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