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P92 - Investigation of Deep Levels in Silicon Carbide using Ion-Induced Charge Transient Spectroscopy

Friday, 11 July 2014 13:00 (1 hour)

Silicon Carbide (SiC) is a promising candidate of particle detectors for its high radiation resistance. For such a SiC application to particle detectors, it is necessary to clarify the relationship between radiation induced deep-level defects and degradation factors in thier device performance. However high resistivity of SiC prevent to investigate these defects by conventional deep level transient spectroscopy (DLTS). On the other hand, there is an arise of charge transient spectroscopy using charge induced by particle irradiation into Si and SiC detectors [1,2]. In this study, we have applied charge transient spectroscopy using charged particles such as alpha particles from an americium (241 Am) radio isotope and also heavy ion microbeams (the details of evaluation techniques are presented in elsewhere [2,3]) to the measurement of the deep-level defects in SiC particle detectors, in order to investigate effects of radiation-induced damage on their Charge Collection Efficiency (CCE) . Firstly, 4H SiC Schottky Barrier Diode (SBD) particle detectors were irradiated with 1 MeV electrons or 3 MeV protons to create the radiation damage inside of the detector. Then irradiated and non-irradiated 4H SiC SBD detectors were both sequentially probed with charge transient spectroscopy systems with a probe of 5.5 MeV alpha particles and focused heavy ions of 10.5 MeV oxygen. The details of the charge transient spectra obtained from SiC SBD detectors with defects created by different radiation exposures will be discussed in the presentation.

References
[1] J. S. Laird et al., J. Phys. D, Appl. Phys., 39, (2006) 1342.
[2] N. Iwamoto et al., IEEE Trans. Nucl. Sci. 58 (2011) 305.
[3] T. Ohshima, et al., “Development of Diagnostic Method for Deep Levels in Semiconductors using Charge Induced by Heavy Ion Microbeams”, submitted to ICNMTA2014.

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