Contribution ID: **51** Type: **not specified**

Bistability of the BiOi complex –a reason for the observed large scattering in the determined acceptor removal rates in irradiated p-type silicon

Monday 21 June 2021 10:20 (20 minutes)

Our study focused on the BiOi defect, as determined from DLTS and TSC experiments, in connection with the acceptor removal rates in B-doped silicon PAD and LGAD diodes irradiated with 23 GeV protons and 1 MeV neutrons. We followed the dependencies on doping, irradiation fluence and particle type in a try of understanding the large scattering in the results reported previously for acceptor removal rates in p type Si. We show that the main reason behind is the metastable behavior of the BiOi defect which can exists in at least two configurations (labelled as A and B). The switch between the different BiOi defect configurations was observed for defect concentrations exceeding 1012 cm-3 in both, high resistivity and medium doped silicon and only through variations detected in the A configuration of the defect, characterized by a donor energy level at ˜0.25 eV from the conduction band. The defect reversibly passes from one configuration to another after exposing the samples to an excess of carriers, achieved by thermal treatments at moderate temperatures or by the inherent exposure to the ambient light when manipulating the samples prior to the electrical measurements performed in dark, indicating thus a bistable character of the center. It also change its electrical activity causing not only significant long time variations in both, the effective doping concentration - Neff and the concentration of BiOi defect, as determined from the emission of electrons by the donor level of the A configuration, but also an underestimation of the true introduction rate of the BiOi defect and of the "acceptor removal"rate. Any electrical measurement performed before the BiOiA(0/+) configuration is stabilized will give a different result. Thus, we conclude that such procedural reasons are contributing significantly to the large scattering in both, the reported values concerning the "acceptor removal"as determined from C-V/I-V measurements and the BiOi introduction rate as detected in DLTS and TSC measurements.

Authors: Mr NITESCU, Andrei (National Institute of Materials Physics); Dr BESLEAGA, Cristina (National Institute of Materials Physics); KRAMBERGER, Gregor (Jozef Stefan Institute (SI)); PINTILIE, Ioana (NIMP Bucharest--Magurele, Romania); MOLL, Michael (CERN)

Presenter: PINTILIE, Ioana (NIMP Bucharest-Magurele, Romania)

Session Classification: Defect and Material Characterization - Acceptor removal studies