

Current Deep Level Transient Spectroscopy (I-DLTS) technique applied to p-type silicon diodes for Acceptor Removal studies

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Two current-based microscopic analysis methods - TSC and I-DLTS - with current injection and/or optical filling (in development) were recently and effectively used by CERN RD50 Acceptor Removal project group as reciprocal tools in the investigation of highly irradiated p-type silicon sensors and their related radiation hardness study aiming to understand and parametrise the existing acceptor removal problem. For such devices, defect filling has become a major issue in the defect identification, for which the contest between filling and emission processes, but also - competition and interaction among various defect levels have been carefully examined and taken into account. For several detected defect levels including the two of the main interest - BiOi and CiOi, the clear dependence between the filling conditions (T_{fill} , t_{fill} , UP), but also V_{bias} and N_t concentration was ascertained, which makes the problem of acceptor removal parameterisation extremely difficult to solve. The optimised protocol in defect filling conditions as well as a quantitative analysis of the I-DLTS, C-DLTS and TSC results on electron irradiated PiN diode as an example will be discussed.

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