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Characterization of acceptor removal in epitaxial silicon pad diodes

The so-called acceptor removal effect has been studied on a set of p-type silicon sensors irradiated with protons and neutrons up to $7E15$ neq/cm². Two sets of diodes were used: thin epitaxial diodes with different resistivities (10, 50, 250 and 1000 Ohm.cm) and high resistivity float zone diodes with different thicknesses (100, 150, 200 and 285 μ m). CV, IV and TCT measurements were performed to extract the effective doping concentration of these devices. TCT collected charge vs voltage was used to evaluate the sensor's bulk space charge, providing evidence of type inversion in low resistivity p-type silicon sensors when irradiated by protons. Additionally, defect spectroscopy was conducted using TSC technique in order to study the correlation between BiOi concentration and acceptor removal. The Neff vs fluence plots were fitted, from which acceptor removal rate parameters were extracted.

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