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Electrical properties of highly oxygenated silicon diodes.

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Defects in silicon are intentionally and unintentionally introduced into the surface and bulk of silicon diodes. Defect engineering is the manipulation of the type, concentration, spatial distribution and mobility of defects within the material. This is done either by metal doping, impurity doping and by irradiation before the fabrication of the detector. These effects create a cascade of interactions generating interstitial and vacancy defects. The defects recombine in a short time and form chemically stable complexes and clusters of defects. These defects diffuse through the crystal and react with impurities such as oxygen.
Some of these defects under irradiation have a negative impact on the electrical properties of silicon such as shorter minority carrier lifetime, increased leakage current which is due to introduction of generation centres, and the introduction of additional space charge density which will cause variations in full depletion voltage of the silicon device.
These changes are due to deep level acceptor-like radiation induced defects such as di-vacancy bonded to oxygen. V2O is also responsible for the formation of negative space charge under bias.
Improved radiation-hardness can be accomplished by the suppression of the formation of V2O centres and in highly oxygenated silicon devices. For radiation-hardness in silicon devices oxygen concentration is around 1018 cm-3 with high resistivity this is to ensure wide depletion zones thus increasing detection efficiency.

Key words: defect formation, Si electrical properties, radiation hardness.

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YES

Level for award
 (Hons, MSc,
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PhD

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