Contribution ID: **1** Type: **not specified**

Nitrogen impact on vacancy aggregation in silicon single crystals

Wednesday 19 November 2014 09:40 (20 minutes)

Topsil is a world leading producer of ultrapure FZ Si wafers including the high resistivity material suitable for manufacturing of particle detectors. The company priority is to develop and supply the device-grade material with new, better properties. One of the directions is to study effect of nitrogen doping on density of voids in FZ Si crystals. In view of results reported in literature the presence of nitrogen at the concentration above 1E14 cm-3 suppresses the formation of voids related to vacancy aggregates generated during the crystal growth process. Topsil and Polish-based Institute of Electronic Materials Technology (ITME) have teamed up in a scientific project scoped to gain additional insight into nitrogen behavior in float zone silicon. The project, entitled NitroSil, is aimed at exploring the possibility of making of a new kind of silicon for high energy particle detectors with prolonged lifetime. The new high resistivity FZ Si will be enriched with nitrogen at the concentration above 1E15 cm-3 close to the solubility level. Similarly, like in the case of as grown vacancy aggregates, nitrogen is expected to react with vacancies formed during the irradiation diminishing the density of irradiation-induced vacancy clusters. The studies to be performed concentrate on verification of the nitrogen influence on the concentrations of electrically active vacancy aggregates formed due to irradiation of FZ Si with high energy particles.

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Session Classification: Defect and Material Characterization