Contribution ID: **14** Type: **not specified**

Effect of oxygen on annealing induced defects transformations in epitaxial silicon irradiated with high energy protons

Monday 21 November 2011 13:40 (20 minutes)

We show the results of both qualitative and quantitative analysis of defect levels in standard and oxygen-rich epitaxial silicon subjected to 24 GeV/c proton irradiation with a fluence of 1.7x10ˆ16 cm-2 and annealing at temperatures of 20, 80, 160 and 240 oC. The radiation defect levels in the bandgap have been scanned by High-Resolution Photoinduced Transient Spectroscopy. In the standard epilayer annealed at 240 oC, the concentration of the predominant shallow trap with the activation energy of 130 meV, assigned to the silicon tetra-interstitial (I4),was 1.2x10ˆ15 cm-3. The concentrations of the very deep traps with activation energies of 565 and 575 meV assigned to tri-vacancy(V3) and tetra- vacancy(V4), were 5.0x10ˆ15 and 7.1x10ˆ15 cm-3, respectively.
In the oxygen-rich epilayer annealed at this temperature,the
concentration of the predominant 130-meV trap was 2.2x10ˆ15cm-3.The concentrations of the 565-meV and 575-meV traps,were ˜1x10ˆ15 and ˜1.5x10ˆ15 cm-3,respectively.

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Session Classification: Defect/Material characterisation