Contribution ID: **20** Type: **not specified**

Photoconductivity spectra as a tool for Si material stability control.

Wednesday 19 November 2014 11:10 (20 minutes)

Investigation of different types of Silicon wafers (a few series of MCZ,FZ, epi) allow to reveal the properties of sample that are related with a possible origin of the material stability. It was observed two effects that are seen to be related to the performance of detector fabricated from this material:
1) There are three types of Si. In two groups it was observed a difference in the existence of the levels that cause the long relaxation the free carriers, i.e., accumulation of non-equilibrium carriers, but in one group these levels were excited by photons less than 0.8 eV, in another group by photons less than 1.1 eV. In a third group this effect was absent.
2) The spectral dependence of extrinsic response was dependent on temperature in one group, and the characteristic parameters of spectra were independent on temperature in another group.
The differential photoresponse method of deep level analyze was proposed and the parameters of levels were determined in the silicon that has the excitation accumulation effect.
It was demonstrated that deep levels near to valence band are differently involved in electron-phonon interaction. The crystals in which electron-phonon interaction is efficient has a feature to demonstrate the defect transform induced by nonequilibrium carrier recombination or trapping. The same type levels were observed by photoresponse spectra measurement excited by short pulses emitted by a tunable laser.
The measurement of photoresponse spectra in the test crystals could be used for the selection of silicon crystals that are more stable and less pronounced trapping effects.

Summary

It is proposed to use the photoresponse spectra measurement at low temperature to recognize an existence of deep levels characterized by strong electron-phonon interaction and of traps responsible for a long memory of excitation.

Author: Prof. VAITKUS, Juozas (Vilnius University)

Co-authors: Dr MEKYS, Algirdas (Institute of Applied Research, Vilnius University); Dr GAUBAS, Eugenijus (Vilnius university); Mr MOCKEVICIUS, Giedrius (Institute of Applied Research, Vilnius University); Mr RUMBAUSKAS, Vytautas (Institute of Applied Research, Vilnius University)

Presenter: Prof. VAITKUS, Juozas (Vilnius University)

Session Classification: Defect and Material Characterization