

**STUDIES OF SI/SIO₂ HETEROSTRUCTURES USING
SECOND-HARMONIC GENERATION**

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In this thesis, we report our work on temperature dependence of second harmonic generation in Si/SiO₂, which has led to an enhanced understanding of the physical processes associated with creation of the photo-induced electric field. The experimental data showed that the second- and third-order nonlinear susceptibilities increased with temperature. The data also showed that the number of filled electron trap states at the oxide surface, which is the origin of the photo-induced electric field, doesn't change with temperature. Moreover, the temperature dependence of the trapping rate is a combination effect of electron-phonon scattering, and of the temperature dependence of the Si absorption coefficient and the SiO₂ dielectric constant. We also report our recent SHG studies of silicon-on-Insulator (SOI) wafers and Si/SiO₂/MgO structures, which show that the SHG is a very sensitive tool to monitor properties of the multi-layer structures.

In summary, we demonstrate that second harmonic generation is an effective, nondestructive technique for characterization of thin oxide and multi-interface structures.

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