Characterization of thin films of silicon oxide and SiO2-Si interface by Cathodoluminescent Method

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The physical and chemical characteristics of interface depend on the way of the silicon surface preparation and on the method of the silicon oxide growing. The local high-sensitive method cathodoluminescence (CL) was used to study the properties of the silicon surface prepared by different ways, as well as the thin silicon oxide layers on these surfaces and the evolution of its spectra. The sensibility of local Cathodoluminescent method gives a possibility to measure the luminescence of the silicon oxide layers with thickness of 1-2nm and silicon surface. The existence of Si-O bonds on surface and the thickness of SiO2 layers were detected using the high-resolution x-ray photoelectron spectroscopy (XPS) method. The (111) silicon surface was prepared by different ways: spalling, chemical polish, annealing, passivation by hydrogen, covered by chemical silicon oxide. Two etchants were used for chemical polish (CP) of the silicon surface.

CL study has shown that

- the deeper interface roughness of the silicon lead to the more effective oxide coverage and the appearance of silicon island in thin silicon oxide.
- silicon has the thin layer with disturbed structure near the surface. CL properties of this layer depends on the silicon surface processing
- the surface of silicon with chemical oxide is smooth enough but in three weeks it becomes very rough