

II. 6 “Process Monitoring by Electrical Characterization of Semiconductor Surfaces”

There is a continued need for the more efficient techniques of semiconductor surface and near-surface electrical characterization in the course of device manufacturing, wafer cleaning operations in particular. Electrical characterization is especially relevant as the results obtained can be directly correlated to the performance of electronic devices fabricated using specific surface treatments. In the light of large diameter wafers used in advanced IC manufacturing on one hand and oddly shaped substrates both rigid and flexible used in photovoltaics and display technology on the other, there is a need for innovative approaches to electrical characterization of surfaces and interfaces in advanced semiconductor material systems.

In this presentation general aspects of electrical characterization of semiconductor surfaces for the process monitoring purposes are discussed. Then, two relevant approaches which do not require formation of the functional test devices with permanent contacts are considered. First involves determination of the surface charge density by means of non-contact SPV (Surface Photovoltage) measurements. Variations of the surface charge density are indicative of the changes in the physical/chemical properties of semiconductor surfaces. The second is based on PCD (Photoconductance Decay) method using temporary contact to the measured surface. The discussion of these two methods is supported by original experimental results obtained from the characterization of single-crystal silicon, multi-crystalline silicon, InP, and germanium.

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