Seminar, Department of Physical Sciences, Bose Institute, Kolkata

Interfacial Band Bending and Deep-Level Control in Transition-Metal-Doped Silicon

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- **Abstract:** We investigate the interplay between surface band bending and deep-level electronic states in silver-doped p-type silicon interfaced with aluminum thin films. Ag-induced defect states are probed using Deep-Level Transient Spectroscopy (DLTS), which reveals multiple deep centers characterized by distinct emission dynamics. Electrical characterization through capacitance–voltage (C–V) analysis of Al/p-Si Schottky diodes demonstrates a downward bending of the silicon valence band approaching the metal–semiconductor interface. By contrast, X-ray Photoelectron Spectroscopy (XPS) measurements indicate an approximately flat-band condition several nanometers beneath the surface, arising from the formation of a heavily doped p+-Si region due to Al–Si interfacial reactions. This nonuniform band bending profile points to a subsurface potential well that influences carrier trapping and emission associated with transition-metal-related defects. The resulting band-structure landscape is discussed with respect to its impact on controlled defect charging in silicon-based quantum and optoelectronic device platforms. In parallel, ongoing work on Ti-doped silicon—motivated by recent predictions of titanium color centers—broadens this framework toward silicon-integrated photonic technologies operating in the telecommunication wavelength range.

Date/time: January 16, 2026 (Friday) at 15:00 PM

Venue: Room 204, Physics Seminar Room, (Second floor, UAC, BI)