Reimagining Semiconductors via Nanowire Engineering

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66-110

Abstract:
This talk will provide an overview of my group’s recent efforts to reimagine the structure and function of nanoscale semiconductors. We accomplish this task via nanowire engineering in general, and more specifically, by exploiting the unique synthetic capabilities of the vapor-liquid-solid (VLS) growth technique. Our experimental approach couples the real-time in-situ infrared spectroscopic interrogation of nanowire chemistry with post-growth structure and property characterization. By identifying the specific chemical bonds present during synthesis, we provide a robust foundation from which to rationally achieve novel materials. Our findings demonstrate that transient surface chemistry plays a fundamental, and previously unrecognized, role in the synthesis of semiconductor nanowires. Morphology, defect generation, dopant incorporation, and heterointerface formation are strongly influenced by, and in many cases require, the presence of surface adsorbates. We leverage this insight to design new precursors and fabricate user-programmable defect, kinking, and diameter-modulated superstructures.