

ABSTRACT

Third Workshop on the Fabrication, Characterization, and Applications of 6.1 Å III-V Semiconductors

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The Atomic-Scale Structure of Surfaces and Interfaces in III-V Semiconductor Devices

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NRL has a long-standing effort to develop novel optoelectronic and high-speed devices based on the “6.1 Å” family of semiconductors – InAs, GaSb, and AlSb. Many of these applications are based on heterostructures where the individual components are only several atomic layers thick, presenting a significant challenge to MBE growth technology. One way we are attacking this problem is by characterizing the surfaces and interfaces within the devices on the atomic scale using scanning tunneling microscopy. For example, we may grow a number of samples differently, and then compare their material, optical, and electrical properties. Alternatively, we can take a bottom-up approach, working to understand and optimize the surfaces and interfaces first, and then applying this knowledge to a device. I will review our efforts to reach a fundamental understanding of all the competing physical and chemical processes during growth, and thereby develop knowledge-based strategies for optimizing device fabrication.

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