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Raman characterization of MBE grown mixed As-Sb alloy nanowires

In the short-wave infrared (SWIR) photonic device market, there's a need for small, low weight and low power devices (SWaP). As and Sb based nanowire photonic devices addresses this while demonstrating higher performance than conventional thin film devices. As-Sb nanowires promises more complex device design and SWIR extended wavelength operability when combined with group III materials such as Ga and Al. However, growth of Sb alloys is challenging due to its surfactant nature increasing phase segregation and disrupting crystal growth. Thus, the proper material characterization of Sb based alloy is critical. In this research material characterization of GaAsSb nanowire and core-shell heterostructure variants are explored. The nanowires are grown using an MBE 930 system and characterized using a Horiba Jobin Yvon ARAMIS Raman microscope with a He-Ne laser (633nm). Analysis of GaAs and GaSb LO and TO peak types are analyzed by observing changes in the Raman shifts, and the FWHM. Using this characterization technique, we determine ternary alloy group V mole fraction estimates, lattice mismatch, and growth quality. Raman characterization is powerful technique for the material analysis of As-Sb based nanowire devices.

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