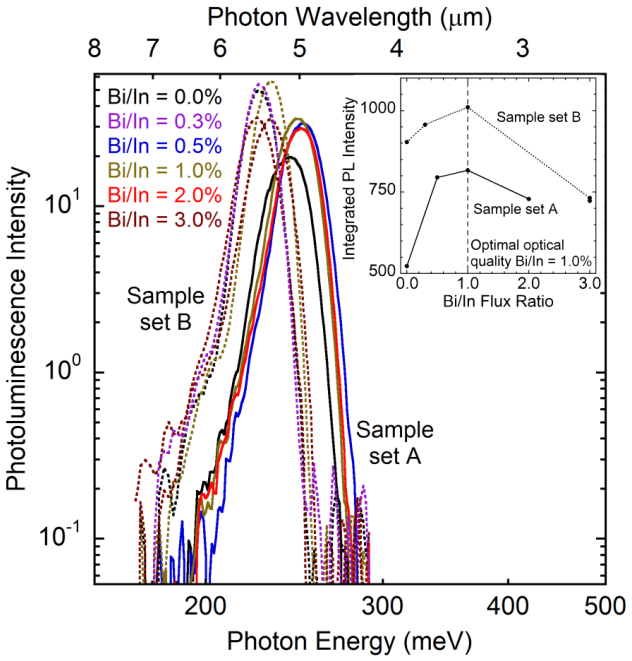
The application of bismuth as a surfactant during the growth of strain-balanced InAs/InAsSb superlattices

Shane R Johnson[+] **and Preston T Webster**
Center for Photonics Innovation and School of Electrical Computer, and Energy Engineering, Arizona State University, Tempe, USA

Recent investigations of the optoelectronic properties of MBE grown strain-balanced type-II InAs/InAsSb superlattices indicate that they have the minority carrier lifetimes and absorption properties necessary for high performance infrared photodetectors [1,2]. The optical performance of this material system can be enhanced by optimizing the constituent layer thicknesses and the Sb mole fraction [2], and through the utilization of bismuth as a surfactant during growth. The presence of a Bi surface layer reduces the incorporation of surface Sb into the InAs/InAsSb superlattice structure and enhances the photoluminescence intensity for dilute Bi fluxes (Bi/In ratio ~ 1%) [3]. As a surfactant, Bi can be applied during the growth of the entire superlattice structure or only during the growth of the constituent InAs layers as a means to moderate the unintentional incorporation of Sb into the InAs material.

The figure shows photoluminescence from strain-balanced InAs/InAsSb superlattices grown at 430 ºC using Bi/In flux ratios ranging from 0 to 3%. The inset provides the integrated photoluminescence intensity versus Bi/In flux ratio (%). The peak efficiency occurs at a Bi/In flux ratio around 1% for 430 ºC growth temperatures. These results and the examination of the unintentional incorporation of Sb into the InAs layers will be presented.



[+] Author for correspondence: shane.johnson@asu.edu

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