

Abstract Submitted
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Nonequilibrium growth of GaInAsSb on GaSb across the immiscibility region by molecular beam epitaxy for midinfrared materials¹ ASLI YILDIRIM, JOHN PRINEAS, Department of Physics and Astronomy, and Optical Science and Technology Center, University of Iowa, Iowa City, IA, 52242 — GaInAsSb is a potentially important mid-infrared material, because alloys can in theory be grown with cut-off wavelengths from 1.7 to 4.9 μm . That potential has been hampered in the past by the presence of large alloy immiscibility regions. In this work, 2 μm bulk GaInAsSb layers lattice-matched to GaSb substrates were grown across the entire compositional range, including the immiscibility region, by molecular beam epitaxy. Lower than typical growth temperatures (410-450 C) were used to limit the adatom diffusion length and move growth conditions further from equilibrium. Using a variety of techniques to characterize the optical, structural, and morphological quality of films, no phase separation was observed to occur for any alloy concentration. High resolution X-ray scans showed one narrow peak, and a single bright photoluminescence peak was observed for all samples. Smooth GaInAsSb surfaces were observed for all samples by AFM measurements, and XTEM images also show GaInAsSb layers to be homogeneous and defect free, with no sign of phase separation. EDS studies have been done, and results show low alloy scatter.

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