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Electrical characterization of GaAsN and GaAsBi single-quantum-well diodes[1] J. OCCENA, R.L. FIELD III, A.S. TERAN, T. JEN, C. KURDAK, J.D. PHILLIPS, R.S. GOLDMAN, Univ of Michigan - Ann Arbor —
The highly mismatched alloys GaAsN and GaAsBi have been identified as promising candidates for the active layer of optoelectronic devices because their bandgaps can be tuned with minimal change in lattice parameter. Since the conduction band minimum (CBM) of GaAsBi and the valence band maximum (VBM) of GaAsN are approximately aligned with the CBM and VBM of GaAs, with corresponding significant valence and conduction band offsets, GaAsN/GaAsBi is expected to exhibit a staggered Type II band-offset. The resulting spatial separation of charge and optical absorption at wavelengths smaller than the fundamental bandgap, on either side of the junction, is promising for both infrared detectors and solar cells. To date, few groups have grown GaAsNBi alloys and the GaAsN/GaAsBi heterostructure has yet to be realized. To explore the N- and Bi-related states near the CB and VB in GaAs(N)(Bi) alloys, Schottky diodes containing GaAsN(Bi) quantum wells (QWs) are grown by molecular-beam epitaxy at low temperature, using Si as either an n- or p-type dopant. For both GaAsN and GaAsBi QWs, rectifying current-voltage characteristics are observed, with reasonable diode ideality factors. We will discuss the influence of increasing N and Bi fraction on the formation of N- and Bi-related states. We will also discuss progress towards measurements of the VB and CB offsets using admittance spectroscopy.

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