Deep Level Defects in Epitaxial GaAsBi/GaAs

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Simon Fraser University, D.A. BEATON, R.B. LEWIS, University of British Columbia, I. KOSLOW, X.D. CHEN, Simon Fraser University, T. TIEDJE, University of Victoria, P.M. MOONEY, Simon Fraser University — Bismuth incorporation in GaAs produces a much larger reduction in the band gap than In or Sb alloying, for the same increase in lattice constant. However, Bi is incorporated only at growth temperatures $<400 \, {^\circ}C$, making deep level defects a concern. Both GaAs layers and p-i-n structures containing a GaAsBi quantum well in the i-layer having a bismide fraction up to 4.7% were grown by molecular beam epitaxy in the range 285-580 °C. Deep level transient spectroscopy (DLTS) measurements of GaAs layers show several different traps, depending on the doping type and growth temperature, but all in concentration $<5 \times 10^{14}$ cm$^{-3}$. Similarly, the DLTS spectra from p-i-n devices vary with the growth conditions and with the bismide fraction and trap concentrations are $<1 \times 10^{15}$ cm$^{-3}$. These DLTS results are consistent with strong photoluminescence and electroluminescence from GaAsBi quantum wells having bismide fraction $\leq 5\%$. The properties of these traps will be discussed.

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