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Measurement of [N] dependence of electron effective mass in GaAsN TASSILO DANNECKER, Tyndall National Institute, YU JIN, Materials Science and Engineering, University of Michigan, JOHN BUCKERIDGE, Tyndall National Institute, CTIRAD UHER, CAGLIYAN KURDAK, Physics Department, University of Michigan, STEPHEN FAHY, Tyndall National Institute, Cork, Ireland, RACHEL S. GOLDMAN, Materials Science and Engineering, University of Michigan — The electron effective mass of $GaAs_{1-x}N_x$ is predicted to be dependent on N-composition, x; however, conflicting results have been observed using cyclotron resonance and thermomagnetic measurements. Using room temperature thermopower and Hall measurements, in conjunction with assumptions of parabolic bands and Fermi-Dirac statistics, we determined the N composition dependence of the electron effective mass of $GaAs_{1-x}N_x$, in comparison with that of GaAs. Measurements of the Seebeck coefficient, S, for N compositions ranging from x=0 to 0.018, reveal a decrease in S with increasing x. The free carrier concentration, [n], for all GaAsN is lower than for GaAs. For GaAs, we extract an effective mass value of $0.052m_e$, slightly lower than the literature value of $0.067m_0$. For GaAsN, the effective mass apparently is in all cases greater than for GaAs but varies non-monotonically with x, revealing a minimum at x=0.010 and maxima at x=0.004 and 0.018. This non-monotonic dependence of m* on x cannot be explained with a simple band anti-crossing (BAC) model. Interestingly, this data is consistent with the predictions of Lindsay et al, suggesting the presence of resonances between N-related states and the GaAsN conduction band edge.

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