Abstract Submitted
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Defect Energy Levels in GaAsBi and GaAs Grown at Low Temperatures[1] PATRICIA MOONEY, KEELAN WATKINS, ZENAN JIANG, ALBERTO BASILE, Simon Fraser University, RYAN LEWIS, University of British Columbia, VAHID BAHRAMI-YEKTA, University of Victoria, MOSTAFA MASNADI-SHIRAZI, DANIEL BEATON, University of British Columbia, THOMAS TIEDJE, University of Victoria — $GaAs_{1-x}Bi_x$ alloys have the potential to extend conventional III-V semiconductor devices to longer infrared wavelengths. The bandgap energy decreases as the Bi fraction is increased, but with a small increase in lattice constant, thus reducing lattice mismatch constraints for GaAsBi/GaAs heterostructures. However, Bi is incorporated into GaAs films grown by molecular beam expitaxy (MBE) only at T_G <400 °C, making defects a concern. DLTS measurements show that trap concentrations in Si-doped (n-type) GaAs layers grown at standard temperatures are $<4\text{x}10^{13}$ cm^{-3}. They increase to $2\text{x}10^{16}$ cm^{-3} when T_G is 390 °C and to $\sim10^{18}$ cm^{-3} when T_G is 330 °C, where the energy level of the dominant defect is E_C-0.40 eV. When only 0.3% Bi is incorporated into n-type GaAs at 330 °C, formation of the E_C-0.40 eV trap is suppressed. Other electron traps, including the dominant traps having energy levels at E_C-0.66 eV and E_C-0.80 eV, are present in similar concentrations in both GaAs and GaAsBi layers grown at 330 °C and, therefore, result from the low growth temperature. The dominant traps are both point defect complexes involving an arsenic atom on a gallium lattice site (AsGa).

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