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Photoluminescence Studies of Type-I and Type-II $In_{0.27}Ga_{0.73}Sb/In_xAl_{1-x}As_ySb_{1-y}$ Multiple Quantum Well Heterostructures Grown by MBE E.R. GLASER, R. MAGNO, B.V. SHANABROOK, J.G. TISCHLER, Naval Research Lab, NAVAL RESEARCH LAB TEAM — Heterojunction bipolar transistors (HBTs) with lattice constant near 6.2Å using the InAs/AlSb/GaSb family of semiconductors are of interest based on their promise for high-speed operation with low power dissipation. A unique aspect of these materials is the ability to engineer the bandgap energies and the conduction band offsets at the emitter/base and base/collector heterointerfaces by varying the In/Al and Al/Sb ratios. In this work low-temperature PL was performed on a set of $In_{0.27}Ga_{0.73}Sb/In_xAl_{1-x}As_ySb_{1-y}$ MQW heterostructures to provide a measure of the conduction band offsets (Δ_{CB}) that are a critical design parameter for the HBTs. Excitation power studies revealed evidence for strong recombination at 0.56 eV within the InGaSb layers of the MQW structure with x,y = 0.52,0.25 and, thus, confirmed the type-I band alignment. In contrast, weaker PL bands at energies close to 0.4 eV and that exhibited strong shifts with increasing excitation power density were found from the nominally type-II MQW samples with x,y=0.67,0.39 and 0.69,0.41. Neglecting small corrections ($\sim$15 meV) due to the electron and hole confinement energies, we estimate Δ_{CB} of $\sim$ 120-150 meV in these Type-II structures.

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