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Probing the band-structures and carrier dynamics of single GaAsSb nanowire heterostructures YUDA WANG, BEKELE BADADA, HOWARD JACKSON, LEIGH SMITH, Dept. of Physics, Univ of Cincinnati, XIAOMING YUAN, PHILIPPE CAROFF, LAN FU, HOE TAN, CHENNUPATI JAGADISH, Dept. Electronic and Materials Engineering, Australian National University — We present the band structure and carrier relaxation of MOVCD grown single GaAs1-xSbx using photocurrent (PC) spectroscopy and transient Rayleigh Scattering (TRS) spectroscopy techniques. The PC spectroscopy was performed on nanowire devices fabricated using e-beam lithography and deposition of Ti/Au as contacts. The devices show nearly Ohmic behavior and are photosensitive. PC spectra shows an onset of absorption at room temperature in agreement with reported values of bulk GaAs0.6Sb0.4. We also used low temperature (10K) transient Rayleigh scattering (TRS) spectroscopy to measure the band structure as well as carrier relaxation dynamics of individual GaAsSb (x=30% and 40%) nanowires with and without InP passivation layers. The band gaps extracted from the TRS experiments are consistent with both photoluminescence (PL) measurements and theoretical predictions. The InP passivated GaAsSb shows smaller Eg due to the tensile strain from InP on GaAsSb as well as longer lifetimes due to the surface passivation. The carrier density and temperature are extracted by a phenomenological fitting model based on band to band transition theory. We acknowledge the NSF through DMR-1105362, 1105121 and ECCS-1100489, and the Australian Research Council.

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