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**Exploring Dynamics and Band Structure in Mid Infrared GaAsSb and GaAsSb/InP Nanowire Heterostructures**[1] LEIGH SMITH, YUDA WANG, NADEEKA WICKRAMASURIYA, SAMUEL LINSER, HOWARD JACKSON, Department of Physics, University of Cincinnati, XIAOMING YUAN, PHILIPPE CAROFF, HOE TAN, CHENNUPATI JAGADISH, Department of Electronic Materials Engineering, Australian National University — We study the carrier recombination dynamics and band structure of $GaAs_{1-x}Sb_x$ and $GaAs_{1-x}Sb_x$/InP core/shell nanowires (NWs) grown by MOCVD. Using Transient Rayleigh Scattering (TRS) measurements and Raman scattering measurements in single unstrained bare core and strained core-shell NWs, we measure the strain distributions in the core and shell and its effect on band structures. At 10 K, the band gap of the $GaAs_{0.7}Sb_{0.3}$ core is seen using TRS to move to lower energy because of the tensile strain from the InP shell. This tensile strain is confirmed by micro-Raman which show the InP phonons shift to higher frequencies while the $GaAs_{0.7}Sb_{0.3}$ phonons move to lower frequencies. The recombination lifetimes in bare $GaAs_{0.7}Sb_{0.3}$ NWs are found to be less than the 50 ps at all temperatures, which is limited by our system response. In contrast, the lifetimes measured in the $GaAs_{0.7}Sb_{0.3}$/InP core/shell NWs are 820ps at 10K and 130ps at 300K. This significant lifetime enhancement reflects the effectiveness of the InP shell surface passivation. We infer that the surface recombination velocity reduces from ˜100,000 cm/s to ˜3,000 cm/s in the core-shell NW.

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