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Carrier Lifetimes in a GaPAsN Intermediate Band Semiconductor[1] JAMES HEYMAN, Macalester College, ADAM SCHWARTZBERG, Lawrence Berkeley National Laboratory, ELLIOT WEISS, JOSHUA ROLLAG, Macalester College, KIN MAN YU, City University of Hong Kong, ALEX LUCE, California Clean Energy Fund (CalCEF), OSCAR DUBON, University of California at Berkeley, JANJIN KUANG, CHARLES TU, University of California at San Diego, WLADEK WALUKIEWIC, Lawrence Berkeley National Laboratory — Multiband semiconductors may form the basis of efficient intermediate band solar cells, if sufficiently long carrier lifetimes can be engineered. We used transient absorption spectroscopy to measure carrier lifetimes in $GaP_yAs_{1-x-y}N_x$. These measurements probe carrier populations in the conduction band, intermediate band and valance band as a function of time after an excitation pulse. Following photoexcitation of $GaP_{0.32}As_{0.67}N_{0.01}$ we find that the electron population in the conduction band decays exponentially with a time constant t_{CB} =23ps. Electrons in the intermediate band exhibit bimolecular recombination with holes with recombination constant $r = 2\bullet10^{-8}$ cm^{-3}/s. An optical pump pulse excited electrons from the valance band to the intermediate and conduction bands, and the change in interband absorption was probed with a delayed white light pulse. We modeled the optical properties of our samples using the band anti-crossing model to extract carrier densities as a function of time. We will also report THz Transient photoconductivity measurements in these materials.

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