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Picosecond carrier dynamics within the band structure of single InP nanowires with zincblende and wurtzite symmetries M. MONTAZERI, Y. WANG, H.E. JACKSON, L.M. SMITH, Dep. of Physics, University of Cincinnati, Cincinnati, OH, J.M. YARRISON-RICE, Dep. of Physics, Miami University, Oxford, OH, T. BURGESS, H.H. TAN, Q. GAO, C. JAGADISH, Dep. of Electronic Materials Engineering, Australian National University, Australia, Canberra, ACT, Australia — Low temperature transient Rayleigh scattering spectroscopy (TRS) is used to probe the carrier dynamics of single zincblende (ZB) and wurtzite (WZ) InP nanowires (NW). The NWs were MOCVD grown using 50 nm Au-nanoparticles. For ZB NWs, the TRS signal reveals various dynamical processes of the electrons within the conduction band as well as the holes in the degenerate heavy/light bands and the split-off band. The fundamental and the split-off band gaps are measured at 1.423eV and 1.529eV. For WZ NWs, we observe three excitonic resonances associated with the hole bands A at 1.501eV, B at 1.534eV and C at 1.66eV. We also observe clear transitions between the same A and B bands and the second conduction band, resulted from zone folding of the L-valley, which is measured at $\sim$ 230meV higher than the first. The lifetimes of the A, B and C excitons at $\sim$ 800ps, $\sim$ 400ps and $\sim$ 50ps respectively. In addition, a type II transition between electrons confined to small zincblende inclusions and holes confined to the wurtzite is identified which marks the ZB-WZ band-offset. We acknowledge the NSF (DMR-1105362, 1105121), ECCS-1100489 and the ARC.

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