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Photocurrent Spectroscopy of single ZB, WZ InP Nanowires at Low Temperature K. PEMASIRI, A. MAHARJAN, A. WADE, A. KOGAN, H. E. JACKSON, L. M. SMITH, Univ. of Cincinnati, J. M. YARRISON-RICE, Miami Univ., S. PAIMAN, Q. GAO, H. H. TAN, C. JAGADISH, Australian National Univ. — We use photocurrent spectroscopy to study single InP nanowire devices having either zinc-blende(ZB) or wurtzite(WZ) crystal structures as a function of temperature. Photolithography techniques are used to fabricate the Ti/Al metal contact pads separated by 3 microns on several ZB or WZ InP nanowires. Using a tunable (1.3 to 1.55 eV) CW laser, we obtain current-voltage (I-V) photocurrent curves by broad illumination of the InP nanodevice. At room temperature, we find that the photocurrent drops exponentially for photon energies below the fundamental band edge, showing evidence for an Urbach tail. The WZ energy gap (1.408eV) lies 70meV above the ZB energy gap (1.338eV) at room temperature, consistent with previous photoluminescence measurements. The ZB sample at 10K shows strong evidence for a broadened excitonic resonance peak in the photocurrent which lies on the top of the Urbach tail for the ZB device. Analysis of this low temperature photocurrent spectrum is consistent with an exciton absorption peak 5 meV below the fundamental band edge, consistent with the known exciton binding energy. Support provided by the NSF (#0701703, #0806700, #0806572 and #0804199) and the Australian Research Council.

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