Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Exciton Dynamics in Hexagonal InP Nanowires[1] MASOUD KAVEH-BAGHBADORANI, Department of Physics, University of Cincinnati, Cincinnati, OH 45221, U.S.A, WOLFGANG LANGBEIN, School of Physics and Astronomy, Cardiff University, Cardiff CF24 3AA, U.K, QIANG GAO, CHENNUPATI JAGADISH, Department of Electronic Materials Engineering, Australian National University, Canberra, ACT 0200, Australia, HANS-PETER WAGNER, Department of Physics, University of Cincinnati, Cincinnati, OH 45221, U.S.A
— We study the exciton dynamics in InP nanowire ensembles by intensity- and temperature-dependent photoluminescence (PL) measurements, time-correlated-single-photon-counting (TCSPC) and heterodyne detected four-wave-mixing experiments (HFWM). The InP nanowires were grown on fused silica substrate by 50 nm gold catalyst metal-organic-vapor-phase-epitaxy at a temperature of 450 °C resulting in nearly wurtzite type nanowires. The PL measurements at 15 K show a strong emission band at 837 nm and two weak side bands at nearly 820 and 860 nm. The bands are tentatively attributed to trapped, free and zinc-blende related exciton transitions, respectively. With increasing temperature the free-exciton band gains importance relative to the dominating trapped exciton band while the low energy band vanishes. TCSPC measurements show an increasing PL decay rate of all emission bands with increasing temperature most pronounced for the low energy band. The result agrees with the exciton population dynamics obtained from three-beam HFWM measurements. Photon echo experiments at 80 K reveal an ultrafast exciton dephasing time of less than 100 fs which is attributed to scattering with a high carrier background in these nanowires.

[1]The support of the Australian Research Council is kindly acknowledged.

Masoud Kaveh-Baghbadorani
Department of Physics, University of Cincinnati,
Cincinnati, OH 45221, U.S.A

Date submitted: 18 Nov 2012 Electronic form version 1.4