Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Photocurrent spectroscopy of confined quantum states in single quantum well tube nanowire devices[1] BEKELE BADADA, TENG SHI, LEIGH SMITH, HOWARD JACKSON, Department of Physics, University of Cincinnati, Ohio 45221-0011, USA, JAN YARRISON-RICE, Department of Physics, Miami University, Oxford, Ohio 45056, USA, QIANG GAO, H. HOE TAN, CHENNUPATI JAGADISH, Department of Electronic and Materials Engineering, Australian National University, Canberra, ACT, 0200, Australia — We investigate optical transitions in GaAs/AlGaAs core-multishell nanowires Quantum Well Tubes (QWT) devices using photocurrent spectroscopy (PC) at low temperature (10K). The GaAs quantum well layer was embedded inside a thick AlGaAs shell surrounding a 50 nm diameter GaAs NW. The single nanowire devices were fabricated by standard photolithography followed by deposition of Ti (20nm)/Al (500nm) metal contacts on either end the nanowire. We present results for two sets of quantum well tubes having quantum well widths of 8nm and 4nm. The QWT nanowire devices exhibit very low (sub pA) dark current and are extremely photosensitive. PC measurements of the QWT devices exhibit photocurrent peaks corresponding to excitons confined to the GaAs core as well as ground and excited states of electrons and holes confined to the quantum well tube, and also in the barrier. Comparisons of the PC spectra with PL and PLE measurements on the same devices show that the peaks associated with the PC spectra show a close correspondence.

[1]We acknowledge the NSF through DMR-1105362, 1105121 and ECCS-1100489, and the Australian Research Council.

Bekele Badada
Univ of Cincinnati

Date submitted: 14 Nov 2013 Electronic form version 1.4