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Quantum-confined Stark shifts of quantum-dot like states in GaAs/AlGaAs core multi-shell nanowires TENG SHI, BEKELE BADADA, HOWARD JACKSON, LEIGH SMITH, Dept. of Physics, Univ of Cincinnati, CHANGLIN ZHENG, JOANNE ETHERIDGE, Monash Centre for Electron Microscopy, Monash University, NIAN JIANG, QIANG GAO, HOE TAN, CHENNUPATI JAGADISH, Dept. of Electronic and Materials Engineering, Australian National University — A 4nm GaAs quantum well tube sandwiched by AlGaAs barriers is formed surrounding a central 50nm GaAs core. The GaAs/AlGaAs core multi-shell nanowires were grown by MOCVD. Single nanowire devices were fabricated through photolithography followed by deposition of Ti/Al metal contacts. We observed photoluminescence (PL) emission with multiple sharp peaks on a single nanowire device at 10K. We attribute these quantum-dot (QD) like states to well width and alloy fluctuations. We apply a bias across the device to investigate the quenching of PL due to external field ionization of excitons and the Stark shifts in these QD like states. Integrated PL emission show quenching on the high energy sideat a lower bias voltage compared to the low energy side.. Quantum confined Stark shifts on individual QDs are observed in the range of couple hundreds of micro-eV, suggesting QD sizes varing from 7 to 15nm. We acknowledge the NSF through DMR-1105362, 1105121 and ECCS-1100489, and the Australian Research Council.

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