Abstract Submitted
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Observation of quantum dots in GaAs/AlGaAs core-multishell nanowire quantum well tubes[1] TENG SHI, HOWARD JACKSON, LEIGH SMITH, University of Cincinnati, JAN YARRISON-RICE, Miami University, CHANGLIN ZHENG, PETER MILLER, JOANNE ETHERIDGE, Monash University, BRYAN WONG, Sandia National Laboratories, QIANG GAO, HARK TAN, CHENNUPATI JAGADISH, Australian National University — We use photoluminescence excitation (PLE) spectroscopy to study the electronic structure of GaAs/$Al_xGa_{1-x}As$ core-multishell nanowires (NW) which define 4 nm GaAs quantum well tubes (QWTs) embedded inside AlGaAs barriers wrapped around a central 50 nm GaAs core. HAADF-STEM images of NW cross-sections show a GaAs layer wrapped around the hexagonal facets with some tapering. Numerical calculations of this structure show the ground states are localized along the corners of the hexagonal QWT. Because of the strong quantum confinement, localized states can easily be formed through width or alloy concentration fluctuations. By using a hemispherical solid immersion lens, we are able directly observe such localized quantum dots (QDs) and map the emission of QDs with a spatial resolution of 600 nm in a single NW. Excitation and emission light polarized parallel and perpendicular to the NW long axis show multiple QDs along the NW long axis with ∼100 micro-eV emission lines. PLE measurements on single dots reveal excited state transitions between confined light or heavy holes to electrons at or above the AlGaAs conduction band barrier.

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