Abstract Submitted
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Electronic Structure and Optical Properties of Spectrally Uniform Nanotemplate-Directed InGaAs/GaAs Quantum Dots in Regular Arrays.[1] JIEFEI ZHANG, Dept. of Physics and Astronomy, Univ. of Southern California, SIYUAN LU, IBM Thomas J. Watson Research Center, Yorktown Heights, ANUPAM MADHUKAR, Mork Family Dept. of Chemical Engineering and Materials Science — Spectrally uniform single photon emitters in spatially regular arrays are highly sought for their potential use in quantum information processing systems. We have utilized nanotemplate-directed on-site growth of quantum dots (NTQDs) approach[1] that exploits engineered surface stress to provide preferred direction for adatom migration during growth to synthesize regular arrays of single InGaAs/GaAs QDs of controlled flat-top pyramidal shape residing on GaAs(001) nanomesa arrays[2].The GaAs/In0.5Ga0.5As/GaAs NTQDs reported here are spectrally uniform within 5nm over 1000um2, order of magnitude better than island and colloidal quantum dots. Photoluminescence (PL) and PL excitation studies of individual NTQDs shows that first excited electron state and dense hole states are, respectively, ˜40meV and ˜10meV higher than ground state. Electrons escape out of QDs through thermally activated tunneling to first excited electron state, which is also manifest in the temperature-dependent behavior of the QD PL decay time. Suitability of such arrays of NTQDs as single photon emitter array will be discussed. [1] A. Konkar, et. al., Jour. Cryst. Growth, 150, 311 (1995) [2] J. Zhang et. al., Jour. Vac. Sc. Tech. B32, 02C106 (2014)

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