Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Atomic Force Microscopy of Vertically Stacked Focused-Ion-Beam Induced Quantum Dots MARTA LUENGO-KOVAC, TIMOTHY SAUCER, Department of Physics, University of Michigan, ANDREW MARTIN, JOANNA MILLUNCHICK, Department of Materials Science and Engineering, University of Michigan, VANESSA SIH, Department of Physics, University of Michigan — Control over the positioning of semiconductor quantum dots (QDs) could facilitate the coupling of QDs to photonic crystal cavities and has applications in the development of high-efficiency solar cells. QDs grown through self-assembly nucleate at random spatial locations. However, a focused ion beam (FIB) can be used to create preferential sites for QD nucleation, and this pattern can be transferred to subsequent layers of QDs, either due to strain or residual effects of the templating. Multilayer QD stacks can therefore maintain the lateral pattern of the initial layer while separating QDs from material damage induced by the patterning. Multilayer QD structures were grown on FIB-patterned GaAs(001) substrates with 10 nm thick GaAs spacers between the layers. The substrates were patterned with sixteen square arrays of holes with spacings of 0.25, 0.5, 1.0, and 2.0 μm each at FIB dwell times of 1.0, 3.0, 6.0, and 9.0 ms. We report on the effects of multilayer QD growth on the initial layers through atomic force microscope (AFM) imaging of single, two-, and three-layer FIB-templated QD samples.

Marta Luengo-Kovac
University of Michigan, Ann Arbor

Date submitted: 07 Nov 2012

Electronic form version 1.4