Abstract Submitted
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Strain driven organization of SiGe islands on ultra-thin Si cantilevers[1] CLARK S. RITZ, University of Wisconsin, Madison, FRANK S. FLACK, MICHELLE M. ROBERTS, DONALD E. SAVAGE, MAX G. LAGALLY — Silicon/germanium 3-D islands have long been studied, both to improve understanding of growth mechanisms in strained epitaxial films and for potential applications as quantum dots (QDs). Self assembly of these QDs into ordered arrays is technologically important, and has been partially achieved through various forms of substrate strain patterning. We experimentally study the effects of substrate local compliancy on the organization of epitaxially grown Ge and Si(1-x)Ge(x) QDs. We form the QDs through the Stranski-Krastanov growth mode on single-crystal ultra-thin Si cantilevers with thicknesses on the order of 20nm. Films are deposited using molecular beam epitaxy and ultra-high vacuum chemical-vapor deposition (CVD) to grow islands on one or both sides of the cantilevers, respectively. Both types of samples show QD ordering along cantilever edges; however, CVD-grown films exhibit additional ordering. Angled SEM imaging shows a strong anti-correlation between the positions of islands grown on the top and bottom faces of the cantilevers. The crystallographic orientation of the cantilevers also plays a role, as islands order better when edges are aligned along [100] (the soft elastic direction). Results will be interpreted in the context of continuum elasticity theory.

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Clark S. Ritz
University of Wisconsin, Madison

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