Abstract Submitted
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Straining Nanomembranes via Highly Mismatched Heteroepitaxial Growth[1] FRANK FLACK, University of Wisconsin-Madison, CHRISTOPH DENEKE, Institute for Integrative Nanosciences, FRANCESCA CAVALLO, MAX LAGALLY, University of Wisconsin-Madison — Semiconductor membranes (NMs) combine the high quality electronic properties of single crystalline material with the increased compliance of a thin sheet. Lately it has been demonstrated that these layers can be used as templates for the growth of self-assembled nanostructures (Ge islands) and the growth is heavily influenced by the compliant substrate. To quantify the interplay between strained growth and compliance, we examine the growth of highly strained InAs on Si NMs. The large lattice mismatch between these two materials causes the substrate to bend due to strain sharing between the film and substrate. Atomic force microscopy of the resulting curved surface shows continuous variation in island density, indicating local modifications of adatom diffusivity and critical film thickness. X-ray diffraction and finite element modeling show that islands near the apex of the bent surface are highly strained and those near the bound edges are fully relaxed. Finally, we present continuum elasticity calculations suggesting that InAs films could grow epitaxially on Si which is not possible on bulk Si.

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