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Role of strain in the stability of hetero-epitaxial island on nanopillars MAXIME IGNACIO, Université Lyon 1, YUKIO SAITO, Keio University, PETER SMEREKA, University of Michigan, Ann Arbor, OLIVIER PIERRE-LOUIS, Université Lyon 1 — Optoelectronics and microelectronics call for new techniques aiming at producing even smaller crystalline components of higher quality. Hetero-epitaxial growth on nanopatterned substrates such as nanopillar forests, is a promising direction to reduce mismatch strain and to obtain higher quality crystals. Indeed, 3D islands are grown on top of the pillars in a configuration which is similar to that of superhydrophobic liquid drops. However, as opposed to the case of liquids, elastic strain plays a major role in hetero-epitaxy. Using Kinetic Monte Carlo Simulations including elastic effects, we have studied in details the stability of a solid hetero-epitaxial island at the top of a nanopillar. We show that mismatch strain strain induces novel states for the island, including spontaneous symmetry-breaking and partial impalement of the islands in the nanopillars. Our results also suggest possible instabilities for solid-state catalytic particles governing nanowire growth.

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