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Non-equilibrium phase stabilization versus bubble nucleation at a nanoscale-curved Interface[1] JARROD SCHIFFBAUER, TENGFEI LUO, University of Notre Dame — Using continuum dynamic van der Waals theory in a radial 1D geometry with a Lennard-Jones fluid model, we investigate the nature of vapor bubble nucleation near a heated, nanoscale-curved convex interface. Vapor bubble nucleation and growth are observed for interfaces with sufficiently large radius of curvature while phase stabilization of a superheated fluid layer occurs at interfaces with smaller radius. The hypothesis that the high Laplace pressure required for stable equilibrium of very small bubbles is responsible for phase stability is tested by effectively varying the parameter which controls liquid-vapor surface tension. In doing so, the liquid-vapor surface tension– hence Laplace pressure–is shown to have limited effect on phase stabilization vs. bubble nucleation. However, the strong dependence of nucleation on leading-order momentum transport, i.e. viscous dissipation, near the heated inner surface is demonstrated.

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Jarrod Schiffbauer
University of Notre Dame

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