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Cavitation Bubble Growth with Phase Transition near a Rigid Wall[1] MAURO RODRIGUEZ, SPENCER BRYNGELSON, TIM COLONIUS, Caltech — Bubbles grow and cavitate near surfaces during biomedical therapies, such as ultrasound-focused ablation of pathogenic tissues (e.g., kidney stones). The tensile part of the wave can nucleate and rapidly grow the bubble, while the compressive part accelerates its collapse. During these oscillations, liquid evaporates into the gaseous bubble, vapor condenses, and gases dissolve into the liquid. It is known that these dynamics affect the bubbles growth and collapse dynamics. However, the regimes where phase change plays a significant role on the bubble dynamics under confinement (e.g., near a rigid wall) are not well studied. We investigate these dynamics using the open-source Multi-component Flow Code [Bryngelson et al. Comp. Phys. Comm. (2020)]. The code solves the 3D, compressible Navier–Stokes equations using a 6-equation multiphase numerical model that is adapted to account for heat and mass transfer. Problems involving the growth and collapse of a water vapor bubble in a free field and near a rigid surface are considered. Simulations of the Keller–Miksis equation are used to verify the numerical approach. Results varying driving pressure and bubble stand-off distances will also be presented.

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