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Numerical simulations of a cavitating bubble with phase transition near an object[1] MAURO RODRIGUEZ, TIM COLONIUS, California Institute of Technology — Understanding the bubble dynamics in and near soft/hard matter is important for biomedical applications, particularly in the context of cavitation-induced damage. Applications include therapeutic, focused ultrasound tools to treat pathogenic tissues (e.g., soft cancerous tissues, hard kidney stones). During the therapy, a cloud of bubbles fractionates the surrounding tissue with the violent oscillations and collapse of water vapor/gas(es) bubbles. While not well understood, during bubbles lifecycle (oscillations of growth and collapse) the mass transfer rates across the bubble wall interface plays a significant role on the bubble dynamics, and therefore, treatment efficacy. To investigate this phenomenon, an in-house, shock- and interface-capturing method is used to solve a 3D, 6-equation multiphase numerical model in a Eulerian framework that accounts for thermal and mass transfer across material interfaces. A canonical problem involving the growth and collapse of a bubble with gas and vapor in a liquid is considered. Comparisons between 1D Keller-Miksis-type and 3D spherical bubble simulations will be used to verify the approach. Cases involving a bubble with either gas and/or vapor collapsing near an object will also be presented.

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