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Temperature considerations in numerical simulations of collapsing bubbles[1] ERIC JOHNSEN, SHAHABODDIN ALAHYARI BEIG, University of Michigan — In naval and biomedical engineering applications, the inertial collapse of cavitation bubbles is known to damage its surroundings. While significant attention has been dedicated to investigating the pressures produced by this process, less is known about heating of the surrounding medium, which may be important when collapse occurs near objects whose properties strongly depend on temperature (e.g., polymers). Euler simulations are capable of predicting the high pressures thereby generated. However, numerical errors can occur when solving the Navier-Stokes equations for compressible interface problems. Using a newly developed computational approach that prevents such errors, we investigate the dynamics of shock-induced and Rayleigh collapse of individual and collections of gas bubbles, in a free field and near rigid surfaces. We characterize the temperature rises based on the relevant non-dimensional parameters entering the problem. In particular, we show that the temperature of a neighboring object rises due to two mechanisms: the shock produced at collapse and heat diffusion from the hot bubble as it moves toward the object.

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