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High temperatures produced by bubble collapse near a rigid wall
SHAHABODDIN ALAHYARI BEIG, BAHMAN ABOULHASANZADEH, ERIC JOHNSEN, Mechanical Engineering Department, University of Michigan — The collapse of a cavitation bubble is known to have damaging effects on its surroundings. Although numerous investigations have been conducted to predict the pressures produced by this process, fewer have been devoted to determine the heating produced by the bubble collapse. Such heating of the surrounding medium may be important for materials whose mechanical properties depend on temperature (e.g., polymeric coatings). A newly developed computational method to solve the compressible Navier-Stokes equations for gas/liquid flows is used to investigate the dynamics of non-spherical collapse of gas bubbles near rigid surfaces. The subsequent temperature fields are characterized based on the relevant non-dimensional parameters entering the problem, and a model is developed to determine the temperature of the wall based on the temperature of the flow in contact with the wall. We demonstrate that significant wall temperatures may be achieved, depending on the initial location of the collapsing bubble and the heat diffusivity of the material.

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None

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