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Cavitation in Shear Flows SADEGH DABIRI, WILLIAM A. SIRIGNANO, University of California Irvine, DANIEL D. JOSEPH, University of Minnesota — The total-stress criterion of cavitation states that cavitation occurs when the total normal tensile stress in at least one direction exceeds a threshold value. In this study, the effect of viscous stress on the growth of cavitation bubbles in the early nucleation phase is investigated. Nucleation sites of micron size in the two cases of stagnation point flow and Couette flow are considered. The Navier-Stokes equations for multiphase flow are solved utilizing the level-set formulation. The flow properties including the bubble shape are resolved. The bubble center moves with the average velocity of the displaced fluid. For different strain rates in the flow, the threshold pressure at which the bubble becomes unstable and starts to grow is calculated. These results are important in understanding the total-stress criterion for cavitation.

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