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Numerical Simulation of Two-phase flow with Phase Change Using the Level-set Method HONGYING LI, JING LOU, LUNSHENG PAN, IHPC A*STAR, YITFATT YAP, Department of Mechanical Engineering, The Petroleum Institute — Multiphase flow with phase change is widely encountered in many engineering applications. A distinct feature involves in these applications is the phase transition from one phase to another due to the non-uniform temperature distribution. Such kind of process generally releases or absorbs large amount of energy with mass transfer happened simultaneously. It demands great cautions occasionally such as the high pressure due to evaporation. This article presents a numerical model for simulation of two-fluid flow with phase change problem. In these two fluids, one of them changes its state due to phase change. Such a problem then involves two substances with three phases as well as two different interfaces, i.e. the interface between two substances and the interface of one substance between its two phases. Two level-set functions are used to capture the two interfaces in the current problem. The current model is validated against one-dimensional and two-dimensional liquid evaporation. With the code validated, it is applied to different phase change problems including (1) a falling evaporating droplet and the rising of one bubble and (2) two-fluid stratified flow with solidification of one fluid. Comparisons on the bubble and droplet topologies, flow and temperature fields are made for the first case between the falling evaporating droplet and the falling droplet without evaporation. For the second demonstration case, the effect of the superheated temperature on the solidification process is investigated.

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