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Level set immersed boundary method for gas-liquid-solid interactions with phase-change[1] AKASH DHRUV, ELIAS BALARAS, George Washington University, AMIR RIAZ, JUNGHO KIM, Univerity of Maryland, College Park — We will discuss an approach to simulate the interaction between two-phase flows with phase changes and stationary/moving structures. In our formulation, the Navier-Stokesand heat advection-diffusion equations are solved on a block-structured grid using adaptive mesh refinement (AMR) along with sharp jump in pressure, velocity and temperature across the interface separating the different phases. The jumps are implemented using a modified Ghost Fluid Method (Lee et al., J. Comput. Physics, 344:381418, 2017), and the interface is tracked with a level set approach. Phase transition is achieved by calculating mass flux near the interface and extrapolating it to the rest of the domain using a Hamilton-Jacobi equation. Stationary/moving structures are simulated with an immersed boundary formulation based on moving least squares (Vanella Balaras, J. Comput.Physics, 228:6617-6628, 2009). A variety of canonical problems involving vaporization, film boiling and nucleate boiling is presented to validate the method and demonstrate the its formal accuracy. The robustness of the solver in complex problems, which are crucial in efficient design of heat transfer mechanisms for various applications, will also be demonstrated.

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Elias Balaras
George Washington University

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