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Multi-Scale Simulation of Atomization with small drops represented by Lagrangian Point-Particle Model[1] YUE LING, STÉPHANE ZALESKI, Université Pierre et Marie Curie, INSTITUT JEAN LE ROND D'ALEMBERT TEAM — Numerical simulation is conducted to investigate the drop formation and evolution in gas-assisted atomization. The atomizer consists of two parallel planar jets: the fast gas jet and the slow liquid jet. Due to the shear between gas and liquid streams, the liquid-gas interface is unstable, and this eventually leads to full atomization. A fundamental challenge in atomization simulations is the existence of multiple length scales involved. In order to accurately capture both the gas-liquid interface instability and the drop dynamics, a multi-scale multiphase flow simulation strategy is proposed. In the present model, the gas-liquid interface is resolved by the Volume-of-Fluid (VOF) method, while the small drops are represented by Lagrangian point-particle (LPP) models. Particular attention is paid on validating the coupling and conversion between LPP and VOF. The present model is validated by comparing with direct numerical simulation (DNS) results and also experimental data. The simulation results show complex coupling between the interface instability and the turbulent gas jet, which in turn influence the formation and evolution of the drops formed in atomization.

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