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Viscous Coalescence of Two Drops in a Saturated Vapor Phase
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— When two liquid drops come into contact, a microscopic liquid bridge forms between them and rapidly expands until the two drops merge into a single bigger drop. Numerous studies have been devoted to the investigation of the coalescence singularity in the case where the drops coalesce in a medium of negligible vapor pressure such as vacuum or air. However, coalescence of liquid drops may also take place in a medium of relatively high vapor pressure (condensable vapor phase), where the effect of the surrounding vapor phase should not be neglected, such as the merging of drops in clouds. In this study, we carry out Lattice Boltzmann numerical simulations to investigate the dynamics of viscous coalescence in a saturated vapor phase. Attention is paid to the effect of the vapor phase on the formation and growth dynamics of the liquid bridge in the viscous regime. We observe that the onset of the coalescence occurs earlier and the expansion of the bridge initially proceeds faster when the coalescence takes place in a saturated vapor compared to the coalescence in a non-condensable gas. The initially faster evolution of the coalescence process in the saturated vapor is caused by the vapor transport through condensation during the early stages of the coalescence.

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