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Phase field investigation of droplet formation in flow focusing devices FENG BAI, XIAOMING HE, Missouri Univ of Sci Tech, XIAOFENG YANG, University of South Carolina, CHENG WANG, Missouri Univ of Sci Tech — The phase field (P-F) method has been increasingly utilized to simulate multiphase fluids in microscale devices. However, most of the current models are based on mathematical analysis; and the physical meaning and validation of phase field method are still unclear. We demonstrate a phase field model in a flow focusing device to investigate the physical application of P-F method and clarify the role of diffusive term in Cahn-Hilliard equation. A characteristic mobility is defined as the product of the mobility tuning parameter and the square of interfacial thickness. The characteristic mobility reflects the correct relaxation time of the interface. Through systematic numerical investigations, we find that the characteristic mobility should be kept as a constant in order to correctly capture the physical process of droplet formation. This criterion has been verified with simulations by employing different interfacial thicknesses. In addition, this phase field model is validated by experiments with comparison of the size of droplet, the velocity of droplet and the period of droplet formation process.

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