

Self similarity of coalescing droplets on substrates

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Multicomponent liquids in the vicinity of walls are an intriguing system. The coalescence of droplets on a substrate reveals the influence of capillary interactions on a larger scale. We perform computer simulations based on the lattice Boltzmann method and compare the behavior of the interface with recent experimental work. We track the interface position in time and show that the bridge shape is self-similar. We investigate this behavior across a range of contact angles. The behavior for droplets with a 90 degree contact angle deviates from that of droplets with a smaller contact angle. Here we also find a self similarity in time, using a different rescaling. We show the effect this has on the growth of the bridge height and investigate the transition.

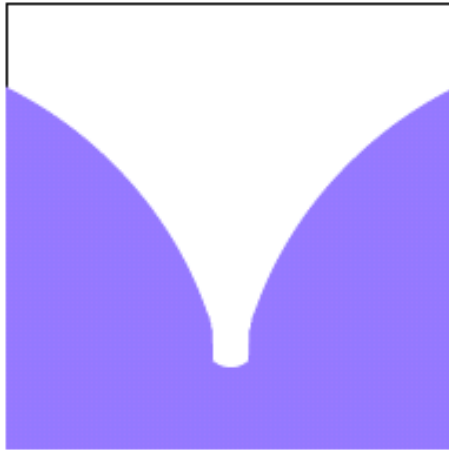


Fig. 1: Magnified bridge shape during coalescence showing the time independent geometry.

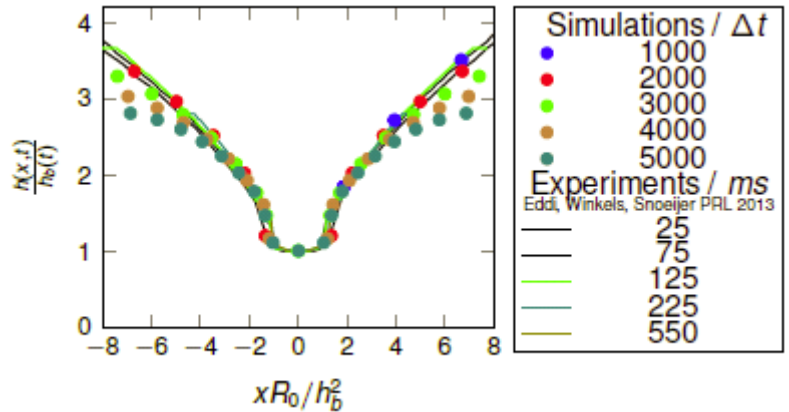


Fig. 2: Interface position near the meniscus in time. Rescaling with the bridge height h_b and initial radius R_0 shows a selfsimilarity in time.

References

1. A. Eddi, K. G. Winkels, and J. H. Snoeijer, *Phys.Rev.Lett.* **111**, 144502 (2013).
2. D. Hessling, J. H. Snoeijer and J. Harting, in preparation (2015)