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Coalescence of nematic liquid crystal droplets on freely suspended liquid crystal films

Freely suspended smectic films of a few molecular layers thick is a model system that can be used to study two dimensional phenomena. In our study, smectic C film was drawn across a few millimeter hole and stabilized under strong surface tension that can suspend 5CB nematic liquid crystal droplets sprayed onto it. Thermal fluctuation of liquid crystal molecules is observed across the smectic C film and can cause the droplets to be driven closer and coalesce. The coalescence in this environment has yet to be studied more extensively [1,2]. When two droplets are touching each other, connecting bridge between them forms and rapidly grows while they merge. Coalescence between them was thoroughly studied through high-speed camera observation and different regimes during coalescence process were analyze. Scaling law for different regimes will be discussed and explained. To understand the experimental result further, we also perform the study of droplet coalescence through finite element software which include inertial force, interfacial force and viscous force in the model. Experimental result and simulation result are compared and analyzed.

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