Hysteresis in spreading and retraction of liquid droplets on parallel fiber rails

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1 Electronic Supplementary Information

1.1 Supplementary Movies

Movie S1: Spreading of liquid droplets on fiber rails.

Movie S1 shows the spreading of an initially spherical droplet on two parallel fibers, corresponding to Fig. 2 in the manuscript. The inter-fiber spacing and droplet volume $(\overline{d}, \overline{V})$ shown in this movie are (1.0, 597.14), (1.7, 601.54) and (1.7, 1296.71). The simulations are performed in a domain of $150 \times 150 \times 800$ lattice sites with two fibers of the equal radius r = 10 lattice sites. The droplets reach three equilibrium configurations, long column, droplet bridge and barrel-shaped drop.

Movie S2: Retraction of liquid columns on fiber rails.

Movie S2 shows the retraction of an initially cylindrical column on two parallel fibers, corresponding to Fig. 3 in the manuscript. The inter-fiber spacing and droplet volume $(\overline{d}, \overline{V})$ in this movie are the same as Movie S1. The simulations are performed in a domain of $150 \times 150 \times 800$ lattice sites with two fibers of equal radius r = 10 lattice sites. The droplets reach similar equilibrium configurations as in Movie S1.

Movie S3: Driven morphological transitions.

Movie S3 shows the liquid morphologies in the bistable region and driven morphology transitions by applying an external force, corresponding to Fig. 6 and 7 in the manuscript. The inter-fiber spacing and droplet volume $(\overline{d}, \overline{V})$ shown in this movie are (1.7, 1105.37) and (1.2, 1104.55). The simulations are performed in domain of $150 \times 150 \times 800$ and $150 \times 150 \times 1000$ lattice sites, respectively. The fibers are of equal radius r = 10 lattice sites. The droplets reach two metastable configurations in the first stage, a droplet bridge and a barrel-shaped droplet. In the second stage, tensile or compressive forces applied to drive the configuration across the energy barrier until the shape begins to relax spontaneously to the stable morphology. The movie is slowed down by factor of 5 when applying the force for better visualization.