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Droplets sliding down inclined planes: unexpected dynamics on elastomer plates AURELIE HOURLIER-FARGETTE, ARNAUD ANTKOWIAK, SEBASTIEN NEUKIRCH, Institut Jean Le Rond d'Alembert, UPMC
— Droplet dynamics on an angled surface results from a competition between the weight of the droplet, capillary forces, and viscous dissipation inside the drop. The motion of droplets on stiff surfaces has been investigated for a long time, both experimentally and theoretically, while recent studies have shown the interesting physics underlying the sliding of droplets on soft surfaces. We focus on the dynamics of water-glycerol mixture droplets sliding down vertical plates of silicone elastomers, highlighting an unexpected behavior: the droplet dynamics on such a surface includes two regimes with different constant speeds. These results contrast with those found in the literature for droplets sliding on materials such as treated glass. We investigate the universality of this behavior on various elastomers, and study in detail the two regimes and the sharp transition observed between them. Different candidates can be responsible for the sudden speed change: bistability, chemical interaction with the substrate, softness of the material, etc. Our experiments to clarify the role of each of them reveal an unexpected link between microscopic phenomena at the scale of the polymer matrix and the macroscopic dynamics of a droplet.

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