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Stick-slip motion and hysteresis behaviour of droplets with dynamic volume variation MARC PRADAS, Department of Chemical Engineering, Imperial College London, NIKOS SAVVA, School of Mathematics, Cardiff University, JAY B. BENZIGER, IOANNIS G. KEVREKIDIS, Department of Chemical and Biological Engineering, Princeton University, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London — We investigate the dynamics of a droplet on planar substrate as its volume increases or decreases. We adopt a diffuse-interface model that incorporates an inflow/outflow boundary condition at the bottom-center of the droplet, hence allowing to dynamically control its volume, and we consider a topographically smooth substrate with a periodic chemical pattern. We observe that the droplet undergoes a stick-slip motion as the volume is increased (inflow conditions) which can be monitored by e.g. looking at the contact points. When we switch over to outflow conditions (i.e. the volume decreases) the droplet follows a different path giving rise to a hysteresis behaviour. By means of geometrical arguments we are able to theoretically predict the full bifurcation diagram of the equilibrium points of the system as the droplet volume is changed, finding excellent agreement with time-dependent computations.

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