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Sliding, pinch-off and detachment of a drop on a wall in shear flow[1] MOHAMMAD N.H. GILANI, HANG DING, PETER D.M. SPELT, Imperial College London — We investigate the motion and deformation of a droplet on a wall in shear flow, accounting for inertial effects and contact-angle hysteresis, with emphasis on the conditions beyond the onset of motion of the droplet. A diffuse-interface method is used for this purpose. Various flow regimes are encountered, including droplets sliding in a quasi-steady state, and entrainment of a part of or almost the entire droplet. A flow regime map is provided. Results for an apparent contact angle inferred from the simulations are shown to collapse onto a single curve when plotted against the instantaneous capillary number (based on the contact-line speed), even after an entrainment event. Finally, the approach to breakup is investigated in detail. Results are presented for the growth of a ligament on a drop, and the reduction of the radius of a pinching neck. The effect of varying several parameters on this behaviour is determined. A model based on an energy argument is proposed to explain the results for the rate of elongation of ligaments.

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