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Transitions between motion regimes of the three phase contact line during the pattern deposition of polymer from a volatile solution[1]
OFER MANOR, MOHAMMAD ABO JABAL, ANNA ZIGELMAN, Technion - Israel Institute of Technology — We investigate the deposition of polymer from a volatile solution. The interplay between different transport mechanisms in the volatile solution determines the motion regime of the three phase contact line and hence the morphology of the deposit. We observe monotonous slip, stick-slip, and periodic wetting-dewetting motions of the contact line. The deposits take the form of continuous coating in the former case and parallel stripes in the two later cases. To investigate transitions between the different motion regimes, we evaporate solutions of Poly-methyl-methacrylate and Poly-dimethyl-siloxane in toluene. The transitions between particular motion regimes of the contact line are connected to two types of competitions between physical mechanisms. A transport competition between polymer diffusion and convection determines the distribution of polymer in the volatile meniscus and hence determines the distribution of spatial variations in the excess energy at the free surface of the solution. A competition between evaporative and surface energy stresses in the liquid meniscus determines the motion of the contact line. We report the temporal variations of the contact line position during each motion regime and use theory to validate our experimental findings.

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