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Contact angle hysteresis in a microchannel: statics METIN HATIPOGULLARI, Université Libre de Bruxelles, CHRISTOPHE WYLOCK, None, MARC PRADAS, The Open University, SERAFIM KALLIADASIS, Imperial College London, PIERRE COLINET, Université Libre de Bruxelles — We study contact angle hysteresis by tracking static meniscus configurations upon varying the volume of a liquid inside a chemically heterogeneous microchannel. We first construct a graphical force balance similar to the classical theory of Joanny and de Gennes [1] for this system, though here with a straight contact line (2D channel). Hysteresis is induced by wettability gradients above a finite threshold value. This is also visualized in a phase plot enabling to easily predict stick-slip events of the contact line and the occurrence of hysteresis. Above the threshold and for non-overlapping Gaussian defects, we find good agreement with the classical formulas for the hysteresis amplitude induced by a dilute system of defects. In particular it is found to be proportional to the square of the defect force and to the defect concentration. For a sinusoidal heterogeneity, decreasing the ratio between the heterogeneity wavelength and the microchannel gap size, brings the system from a sub threshold regime, to a stick-slip dominated regime, and finally to a regime with a quasi-constant advancing and receding angle. In the latter, the hysteresis amplitude is found to be proportional to the defect force.

[1] P.G. Joanny and J.F. de Gennes, J. Chem. Phys. 81: 552 (1984).

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