

Depinning drops on heterogeneous substrates and on rotating cylinders

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ABSTRACT

The onset of the sliding motion of drops on heterogeneous substrates under driving along the substrate occurs at a finite driving force that is necessary to overcome the pinning influence of the heterogeneities [1-4]. We argue that a similar depinning mechanism can occur for droplets of partially wetting liquid on a rotating cylinder [5]. There gravity takes the role of the heterogeneity and the rotation corresponds to the lateral driving. After establishing the parallels in the underlying thin film evolution equations we analyse the bifurcation behaviour in the 2d case (for the rotating cylinder and heterogeneous substrate) and the 3d case (for the heterogeneous substrate). In particular, we describe various depinning scenarios in the 3d case where Rayleigh and depinning instabilities may interact.

The results are obtained by a combination of branch following methods, linear stability theory and direct numerical simulation of the model equation in 2d [1,2,5] and 3d [3,4,6].

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