

Abstract Submitted  
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**Low-order modelling of a drop on a highly-hydrophobic substrate: statics and dynamics**<sup>1</sup> ALEXANDER W. WRAY, University of Strathclyde, OMAR K. MATAR, Imperial College London, STEPHEN H. DAVIS, Northwestern University — We analyse the behaviour of droplets resting on highly-hydrophobic substrates. This problem is of practical interest due to its appearance in many physical contexts involving the spreading, wetting, and dewetting of fluids on solid substrates. In mathematical terms, it exhibits an interesting challenge as the interface is multi-valued as a function of the natural Cartesian co-ordinates, presenting a stumbling block to typical low-order modelling techniques. Nonetheless, we show that in the static case, the interfacial shape is governed by the Young-Laplace equation, which may be solved explicitly in terms of elliptic functions. We present simple low-order expressions that faithfully reproduce the shapes. We then consider the dynamic case, showing that the predictions of our low-order model compare favourably with those obtained from direct numerical simulations. We also examine the characteristic flow regimes of interest.

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