Equilibrium of droplets on deformable substrate: Influence of surface forces and surface deformation

[Abstract]

This item was submitted to Loughborough University’s Institutional Repository by the/an author.

Citation: AHMED, G...et al., 2016. Equilibrium of droplets on deformable substrate: Influence of surface forces and surface deformation. Presented at the 30th Conference of the European Colloid and Interface Society (ECIS), Rome, 4-9th Sept.

Additional Information:

- This is an abstract of a conference paper.

Metadata Record: [https://dspace.lboro.ac.uk/2134/24530](https://dspace.lboro.ac.uk/2134/24530)

Version: Published

Rights: This work is made available according to the conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) licence. Full details of this licence are available at: [https://creativecommons.org/licenses/by-nc-nd/4.0/](https://creativecommons.org/licenses/by-nc-nd/4.0/)

Please cite the published version.
Equilibrium of Droplets on Deformable Substrate: Influence of Surface Forces and Surface Deformation

Gulraiz Ahmed¹, Vasily V. Kalinin ², O. Arjmandi-Tash¹, V. Starov¹

¹Department of Chemical Engineering, Loughborough University, Loughborough, LE11 3TU, UK
²Gubkin Russian State University of Oil and Gas, Moscow, Russia

*g.ahmed3@lboro.ac.uk

Liquid droplets on deformable/soft substrate may cause the substrate to deform. Surface forces and substrate deformation determine the deformed shape of the substrate and its deformability affects the extent to which the substrate gets deformed. In the present work, the equilibrium of liquid droplets on soft substrates is investigated. Disjoining pressure action in the vicinity of the apparent three phase contact line is taken into account. It is shown that both substrate surface tension and elasticity coefficient along with disjoining pressure action determine the substrate deformation. A simplified linear disjoining pressure isotherm and simple Winkler's model to account for the substrate deformation are used which allows deducing analytical solutions for profiles of both droplet and deformed substrate. It is shown that for higher substrate surface tension there exists a smooth transition in the substrate deformation from the bulk of the droplet to the thin film, but as the substrate surface tension is reduced this smooth transition in the substrate deformation tends to transform into a jump.

Acknowledgements. This research was supported by CoWet ITN, EU; MAP EVAPORATION, European Space Agency; COST MP1106, EU