

Modelling wetting properties of micro- and nanostructured surfaces

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Mathematical models and numerical methods will be used to study adhesion of fluid droplets on structured surfaces in both static and dynamical cases. By creating structured surfaces it is possible to enhance the hydrophobic and hydrophilic characteristics of the surface.

In the static case droplet shape forming is determined by invoking minimization of interfacial energies calculated from solid-liquid interfaces and air-liquid interfaces. The droplet shape is determined through the non-linear partial differential Young-Laplace equation. Two static regimes exists; the wetted and the composite. Being in one or the other state could determine whether the drop rolls or slides off a given inclined substrate.

In the dynamical case investigations of droplet dynamics as e.g. rolling on inclined surfaces, bouncing on surfaces and on liquids will be considered. Two different approaches to the dynamical case are going to be considered:

- directly solving the flow to examine the microscopic scale, i.e. creating a geometry involving the structured surface and the flow on this,
- applying a long-wavelength approximation to examine the macroscopic effects of hydrophobic and hydrophilic regions.