Abstract Submitted
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Wetting of heterogeneous substrates. A classical density-functional-theory approach[1] PETER YATSYSHIN, Department of Chemical Engineering, Imperial College London, ANDREW O. PARRY, Department of Mathematics, Imperial College London, CARLOS RASCÓN, GISC, Department of Mathematics, Universidad Carlos III de Madrid, MIGUEL A. DURAN-OLIVENCIA, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London — Wetting is a nucleation of a third phase (liquid) on the interface between two different phases (solid and gas). In many experimentally accessible cases of wetting, the interplay between the substrate structure, and the fluid-fluid and fluid-substrate intermolecular interactions leads to the appearance of a whole "zoo" of exciting interface phase transitions, associated with the formation of nano-droplets/bubbles, and thin films. Practical applications of wetting at small scales are numerous and include the design of lab-on-a-chip devices and superhydrophobic surfaces. In this talk, we will use a fully microscopic approach to explore the phase space of a planar wall, decorated with patches of different hydrophobicity, and demonstrate the highly non-trivial behaviour of the liquid-gas interface near the substrate. We will present fluid density profiles, adsorption isotherms and wetting phase diagrams. Our analysis is based on a formulation of statistical mechanics, commonly known as classical density-functional theory. It provides a computationally-friendly and rigorous framework, suitable for probing small-scale physics of classical fluids and other soft-matter systems.

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