Mercredi 9 juin

à 14h30

IMFT - Amphithéâtre Nougaro

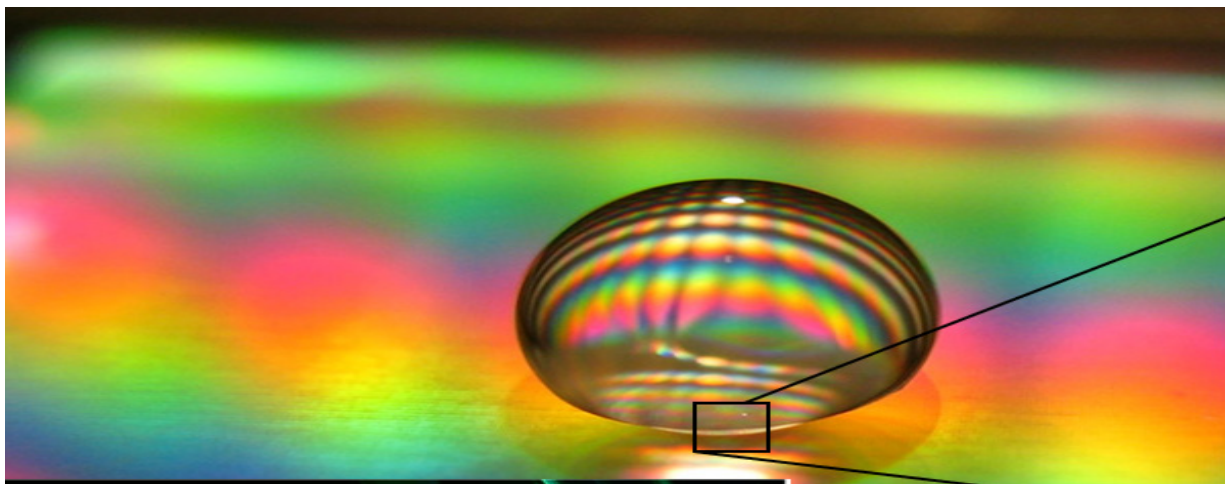
Allée du Professeur Camille Soula 31400 Toulouse

Wetting of heterogeneous surfaces: from contact angle hysteresis to switchable superhydrophobic surfaces

Pr. Frieder Mugele

Physics of Complex Fluids

University of Twente / Faculty of Science and Technology



Owing to the large surface-to-volume ratio wetting properties and the heterogeneity of solid surfaces play an important role in multiphase microfluidic systems. Moderate surface roughness hinders the motion of three-phase contact lines. It leads to the pinning of drops on the window on a rainy day and it limits the speed of drops digital microfluidic devices and other applications. Very strong surface roughness in combination with intrinsic hydrophobicity of the materials involved gives rise to superhydrophobicity, a state in which the effective solid-liquid interaction is particularly weak due to the entrapment of air bubbles at the drop substrate interface. In that state, the contact angle hysteresis is very weak and drop motion is particularly easy.

In this lecture, I will present a series of experiments on the dynamics of drops on heterogeneous surfaces under the influence of electric fields in electrowetting configuration. After an introduction into the basic concepts of electrowetting, I will describe experiments that allow to overcome roughness-induced contact angle hysteresis leading to efficient depinning of stuck drops and to higher translational speeds using AC electric fields. Subsequently, I will describe the microscopic properties of the composite air-water-substrate interface using a technique based on optical diffraction. Electrical fields will be shown to provide excellent tenability of the superhydrophobic properties. The final part of the lecture will be devoted to a discussion the physical mechanisms limiting the stability of the superhydrophobic state and to novel concepts that should eventually lead to reversible switchability of superhydrophobic surfaces.

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