

seminars

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C/Faraday, 9

Conference Hall

Imdea Nanociencia

Ciudad Universitaria de Cantoblanco

Does surface tension/stress/energy affect the mechanics of thin solids?

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The contact of solid surfaces by liquids underlie classical capillary phenomena, such as capillary rise and partial wetting, which have been studied for nearly two centuries. Nevertheless, when the solid surfaces are deformable or bendable, key aspects of the emerging “elasto-capillary” physics become confounding, leading to considerable confusion among workers in this field. At the heart of this confusion is vagueness in elementary concepts: Is a “surface energy” identical to “surface stress” or “surface tension”? Is the mechanics of liquid-vapor interfaces identical to liquid-solid or vapor-solid interfaces? Can a contact with liquid environment imply strain in a nearly inextensible thin solid, such as graphene or a stiff, ultrathin polymer sheet?

In this talk I will address these questions by studying a version of the classical Young’s problem: A liquid drop in contact with a thin, stiff solid film. Several groups suggested recently that the deformation of such a film under the Laplace pressure exerted by the drop allows measuring the solid-liquid and solid-vapor surface energies, or a “pre-tension” in the suspended film. I will explain the fundamental problems underlying such proposals, and will use this example to highlight and elucidate some elementary, yet confusing concepts, whose role is paramount for understanding elasto-capillary phenomena.

Nanociencia y Nanotecnología: lo pequeño es diferente

Nanoscience and Nanotechnology: small is different