Solid-state wetting and dewetting

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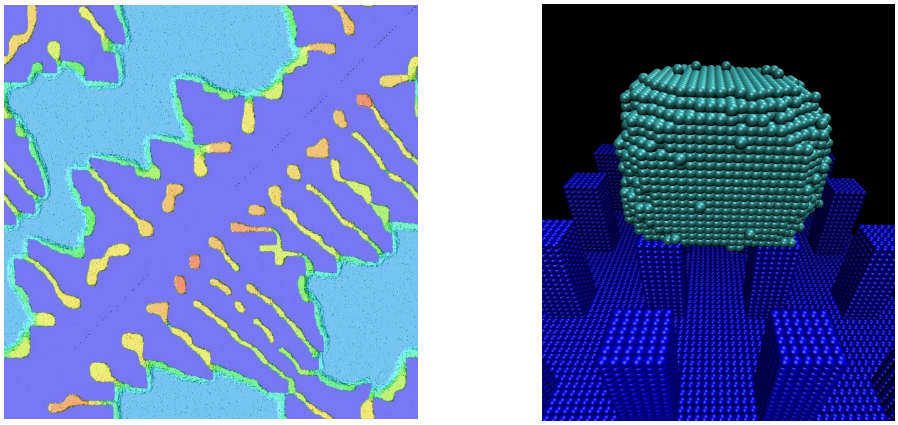
ABSTRACT

At the nanoscale, the morphological evolution of solid films and islands under annealing is strongly influenced by wetting properties. Inspired by analogies with recent advances in the wetting behavior of liquids, we explore two situations where solid-state wetting plays a crucial role.

In a first part, we discuss the dewetting dynamics of a thin solid film based on 2D Kinetic Monte Carlo (KMC) simulations and analytical models. We focus on the role of anisotropy and faceting of the dewetting rim, which changes the asymptotic behavior of the dewetting velocity. In addition, we analyze the instability of the dewetting front, which leads to the formation of fingers.

In a second part, we will present some results on the wetting statics and dynamics of islands (or nanoparticles) on surface topographical structures with a large aspect ratio, such as pillars or trenches using 3D KMC simulations including elastic effects. We show that elasticity induces novel states such as asymmetric and partially impaled configurations.



KMC Simulations-- Left: Dewetting of a thin solid film; Right: Cassie-Baxter state for a nanoparticle

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