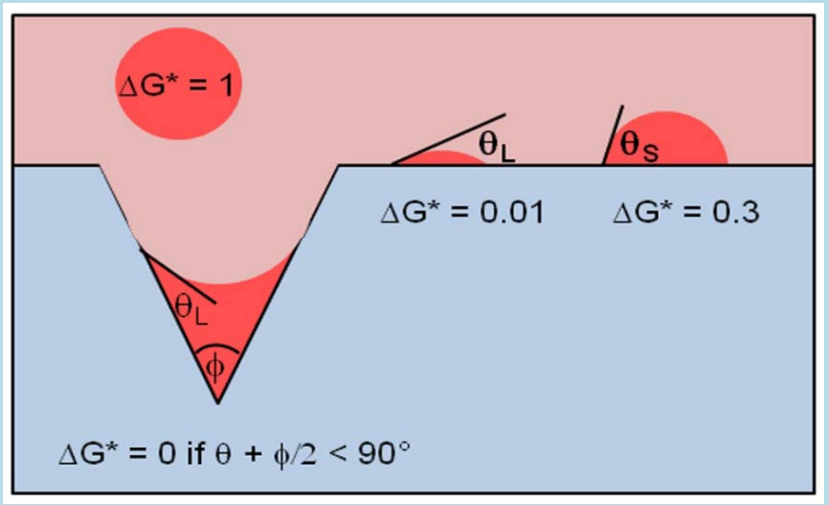
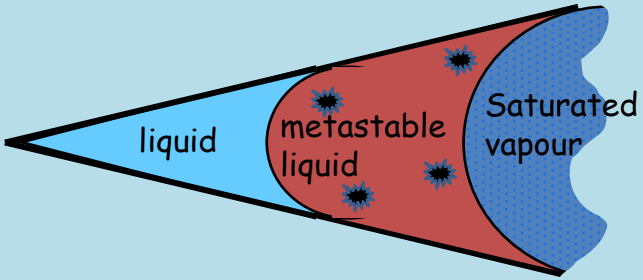
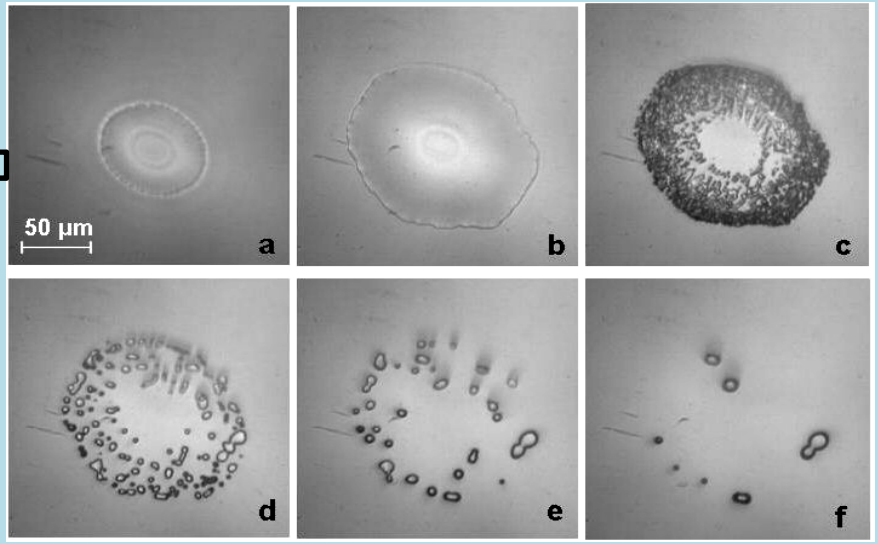
Effect of topography on crystal nucleation – Hugo Christenson

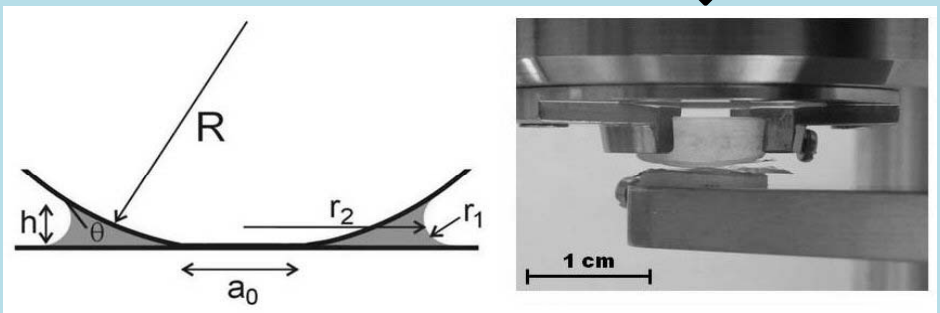
Relative magnitude of free energy barrier to nucleation depends critically on topography





Freezing of supercooled liquid condensates



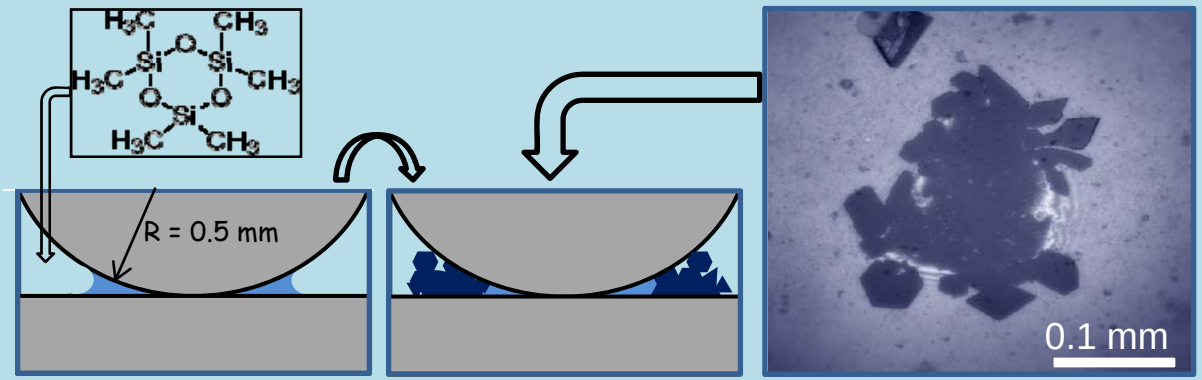


Nanometre-thin, annular liquid capillary condensates form from vapour below the bulk melting point T_m

[J. Phys. Chem. Lett. 3, 1602-1606 (2012)]

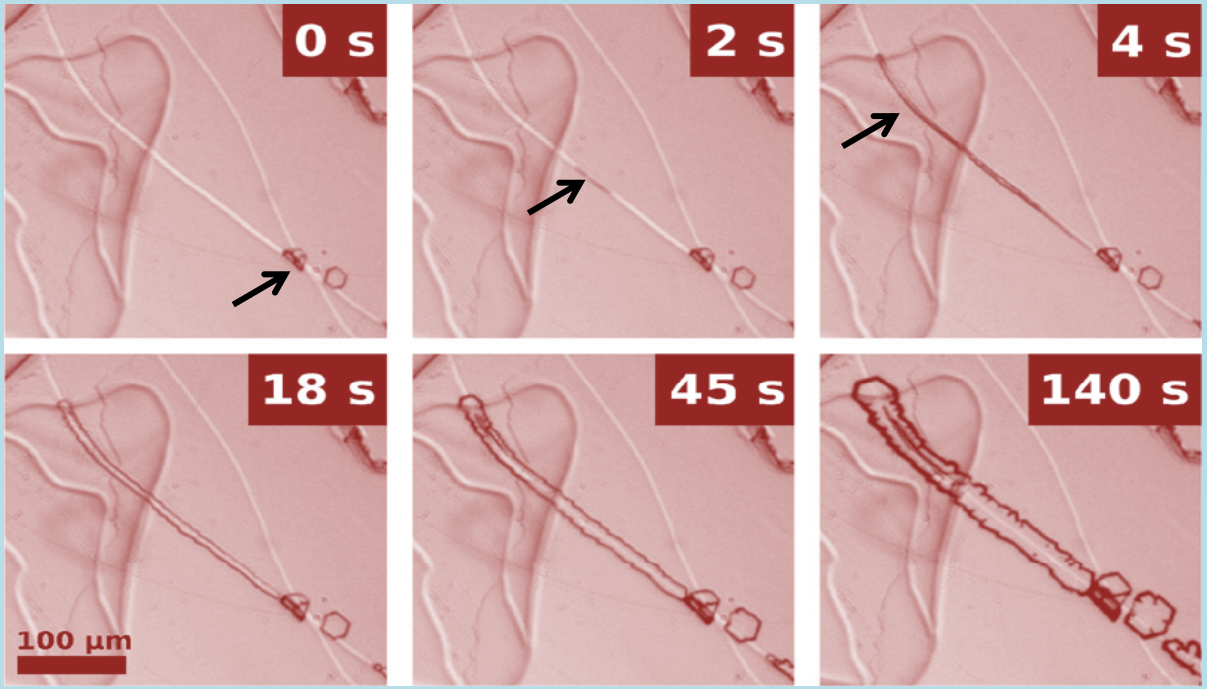
Separation of surfaces bridged by a crystal of

at $\Delta T \approx 60$ K



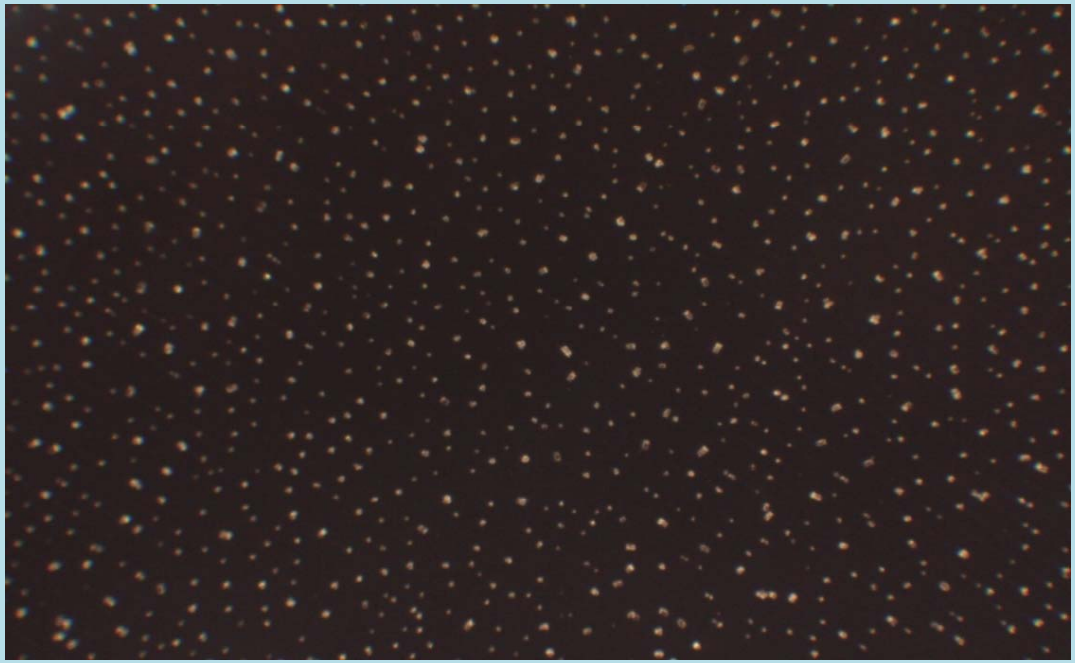
a small glass bead pressed against a microscope slide

nucleation at $\Delta T \approx 60$ K



Growth of camphor crystals (hexagonal) from vapour at $S \approx 1.7$ along a step edge on a muscovite mica surface.

Neo-pentanol crystals nucleating from vapour on mica [Cryst. Growth Des. 12, 750-755 (2012)]



Ice crystals depositing from vapour at – 60 °C in 100 nm × 10 nm deep grooves milled 20 μm apart on an oxidised silicon wafer.

Can capillary condensation followed by freezing account for the enhanced nucleation rate in grooves and pits?

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