Wetting, Pickering Emulsions and Pickering Foams

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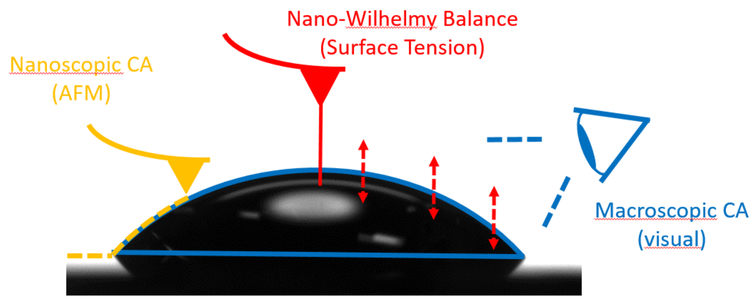
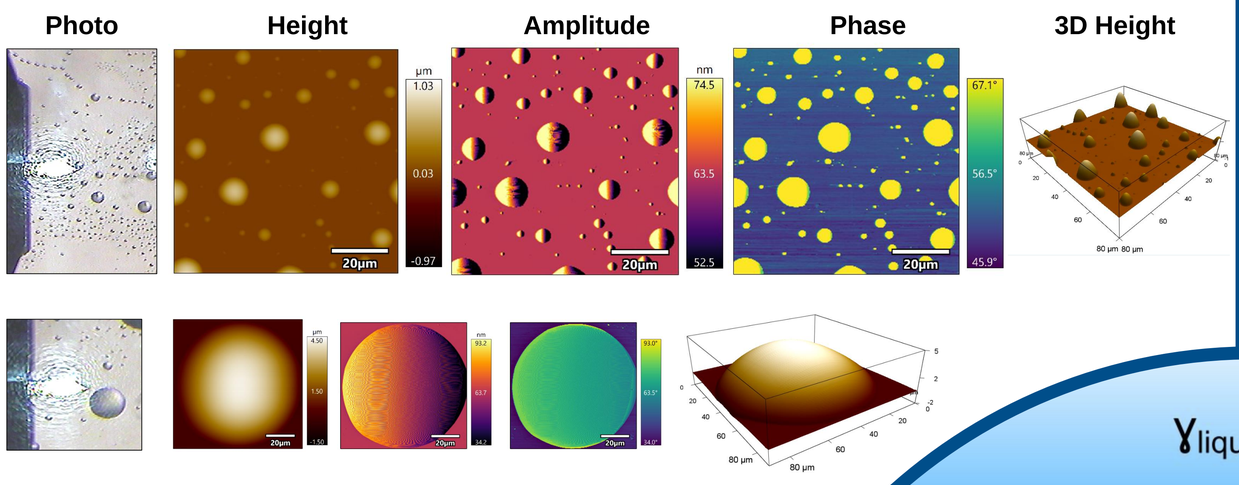
Wetting of Complex Surfaces

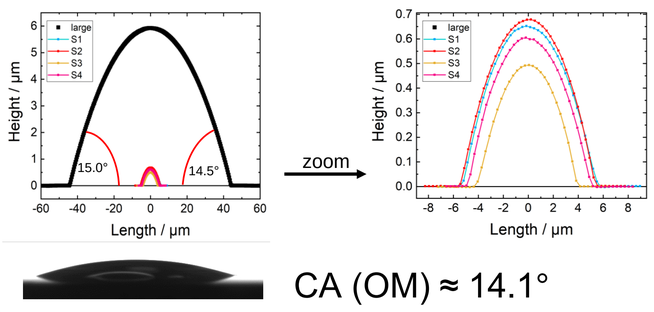
- Wetting and imbibition on a nanoscale
- AFM resolves the contact line with a resolution in the order of 10 – 30 nm
- Optical microscopy (OM) yields macroscopic contact angles (CA)



Example: Dodecene on Silicon Substrates

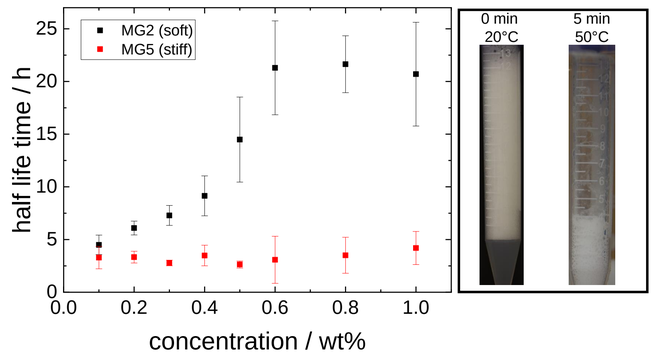


Cross sections



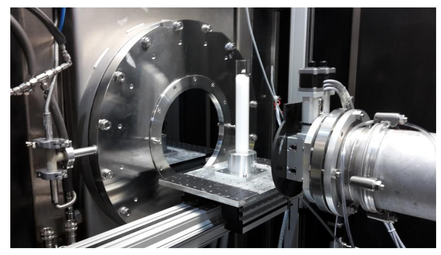
CA (OM) ≈ 14.1°

Microgel Foams

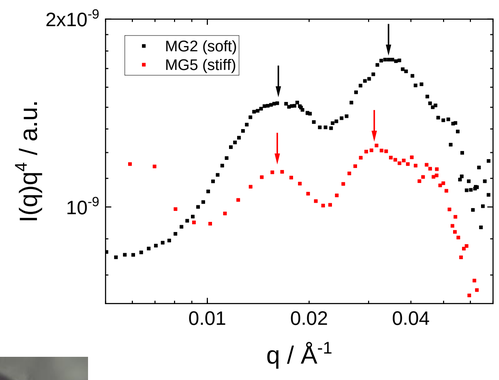


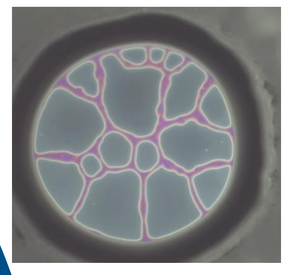
- Microgel (MG) foams are thermoresponsive
- Foam stability depends on MG stiffness

Home built cell for small angle neutron scattering (SANS) at foams

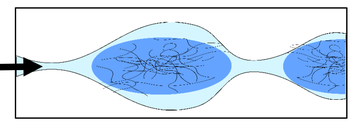


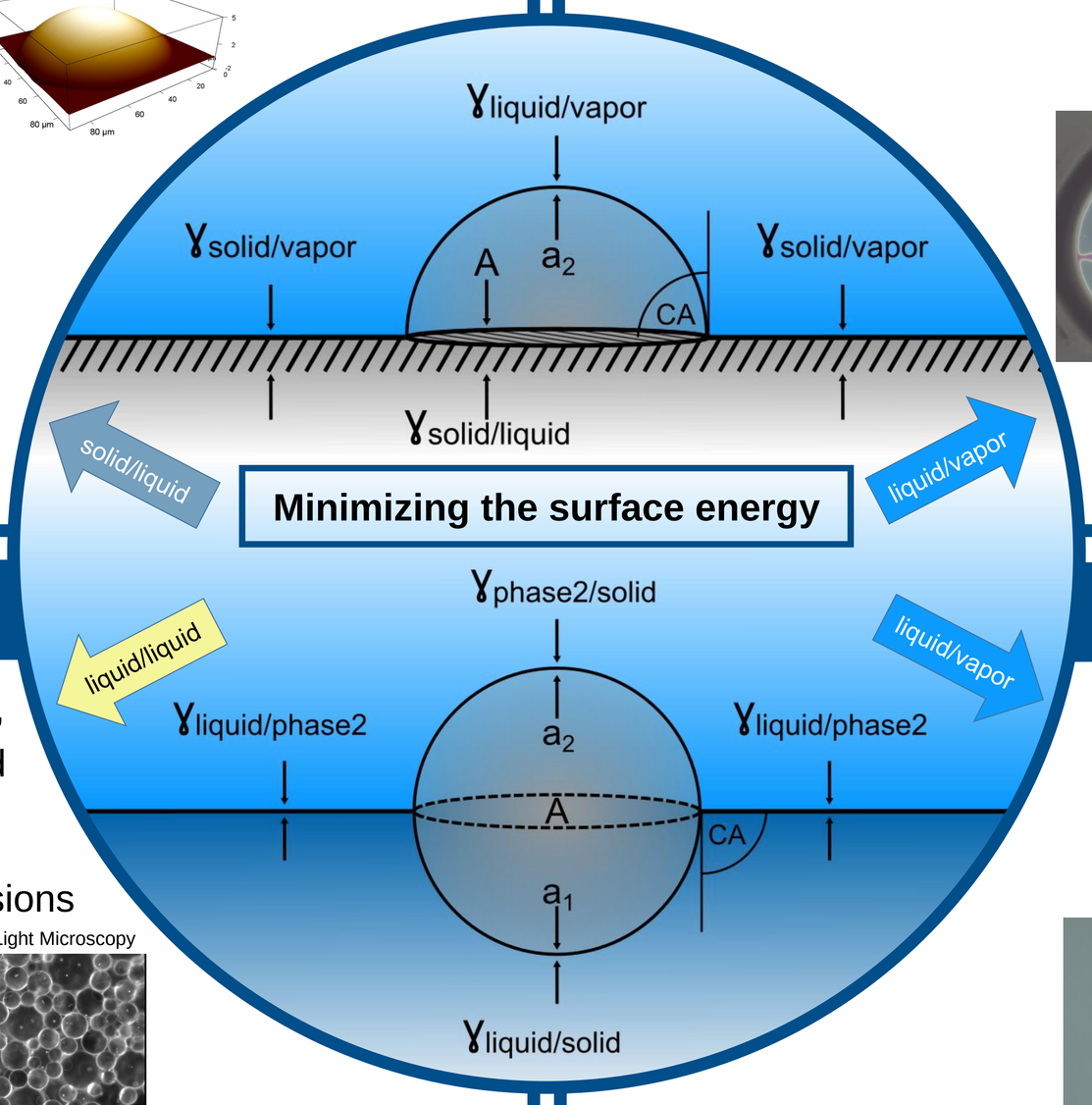
Sample	d / nm	BIS / mol %	R_H / nm
MG2	34	2	378
MG5	39	5	256





Single MG foam film
→ Very inhomogeneous
→ Only thinner (grey) areas visible in SANS

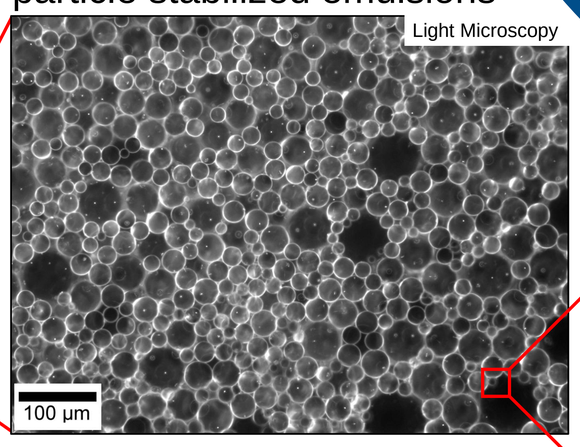


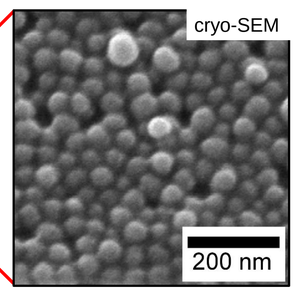


Pickering Emulsions

Emulsion = mixture of immiscible liquids, e.g. milk, cosmetics, mustard

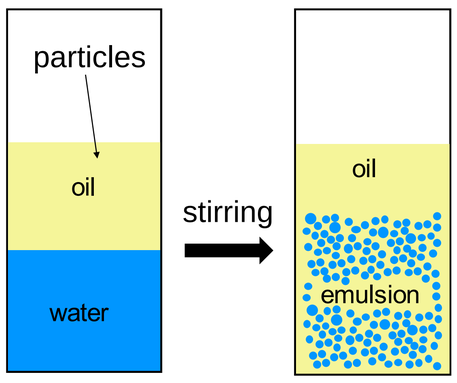
Pickering Emulsions = particle stabilized emulsions



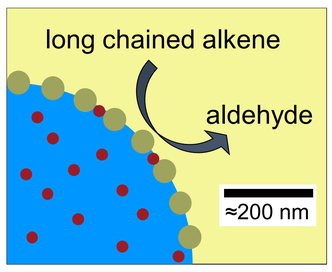


- High internal surface
- Outstanding stability

Preparation:
Stirring water/oil mixtures at ambient conditions



Application:
Reaction environment for interfacial catalysis

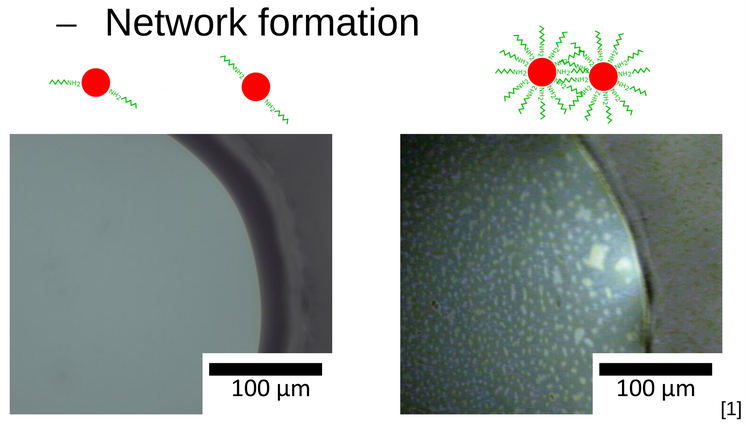


catalyst
particles

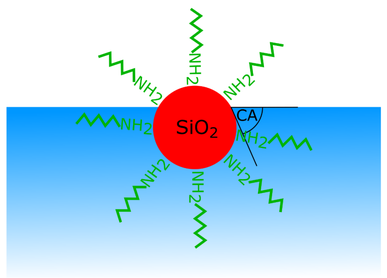
Retain catalyst in water
→ Recycle catalyst

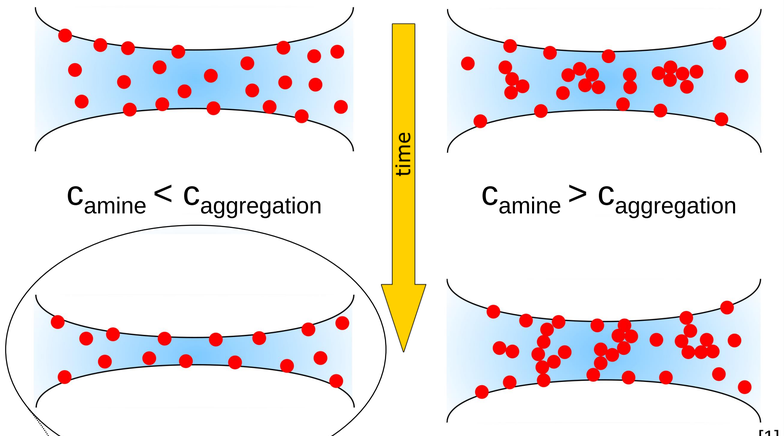
Particle Foam Films

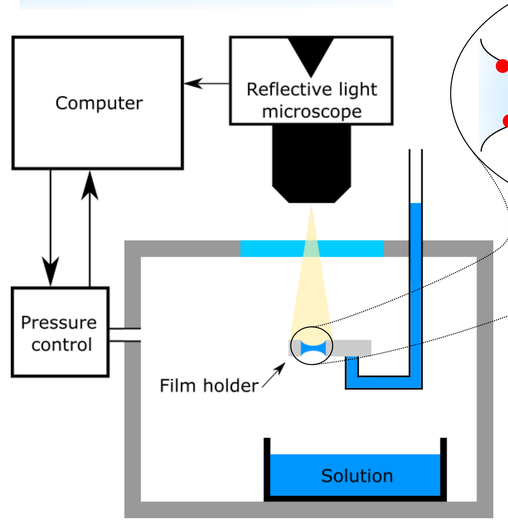
Foam films stabilized by particles by:
- Drainage hindrance
- Network formation



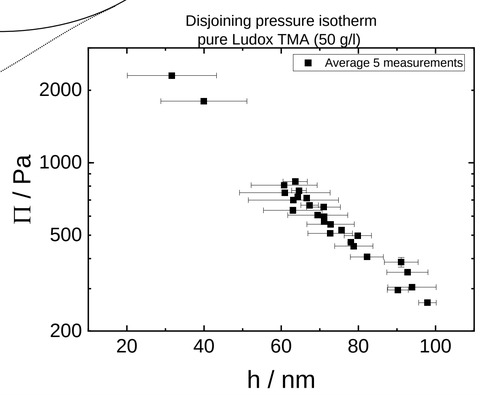
Alkyl amine adsorbed to silica nano particles







Thin Film Pressure Balance



[1] From F. A. Carl, Stabilization of foams by in-situ hydrophobized nanoparticles, PhD Thesis, Technische Universität Berlin, 2016