



How Soft Matter Approaches Bring New Tools For Biotechnology

Sylvie Beaufls, A Renault, A. Saint-Jalmes, G. Paboeuf, Stephane Pezenneec, Cécile Le Floch-Fouéré, Valérie Lechevalier-Datin, Francoise Nau, Maryvonne Pasco, Said Bouhallab

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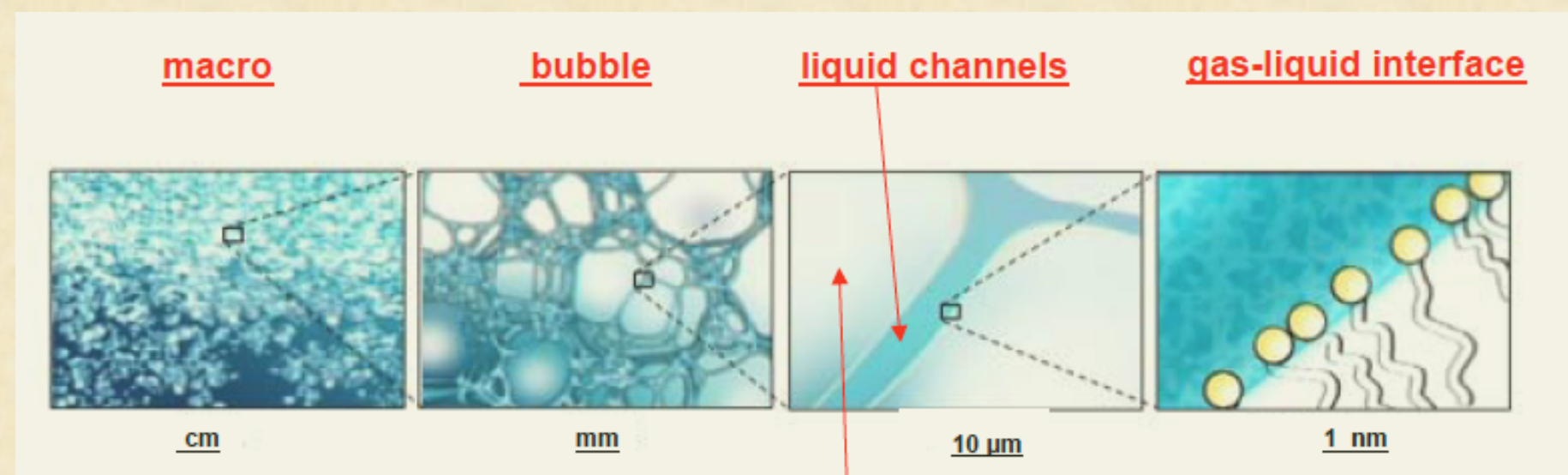
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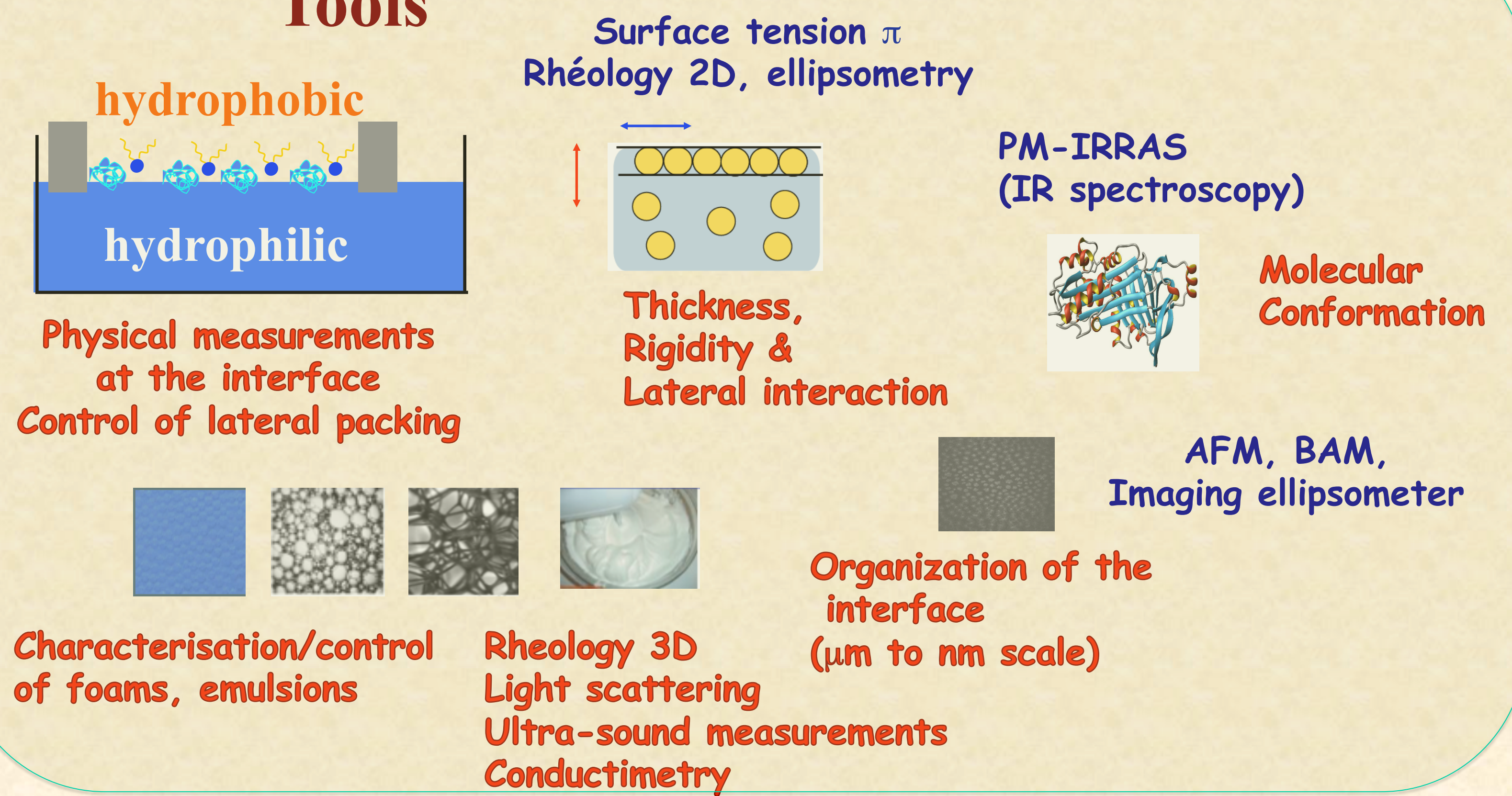
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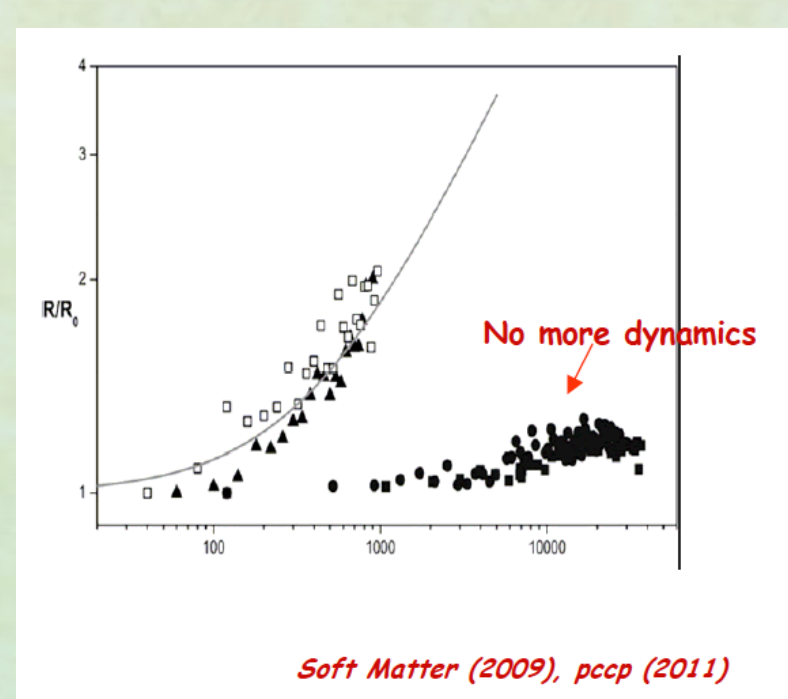
Foams, emulsions: hierarchical media controlled by interface stability



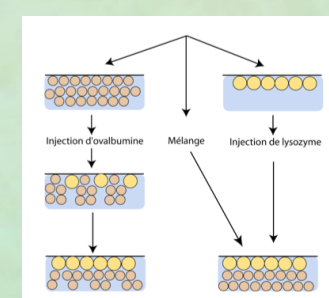
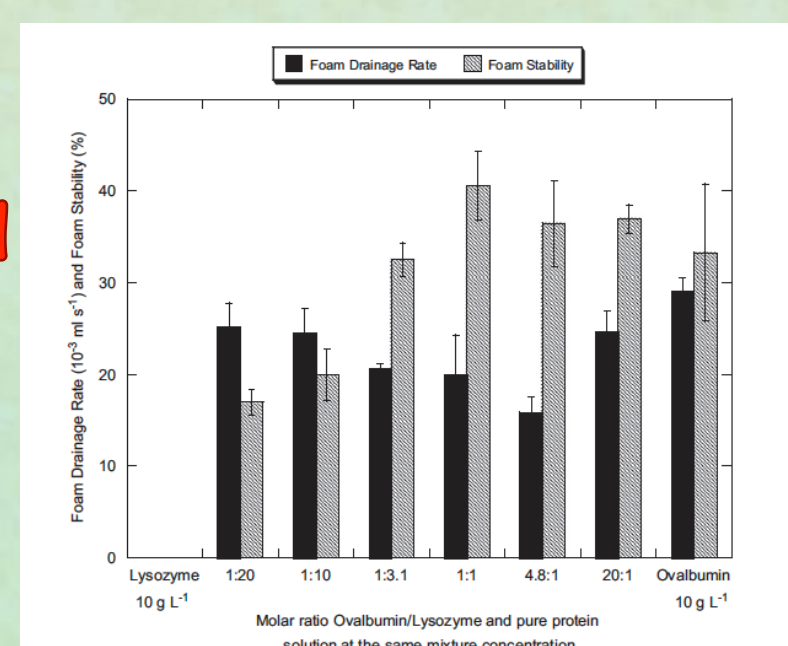
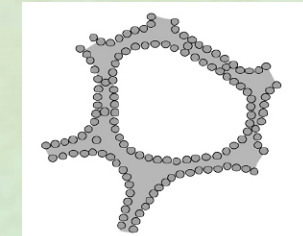
Tools



Routes to stop coarsening



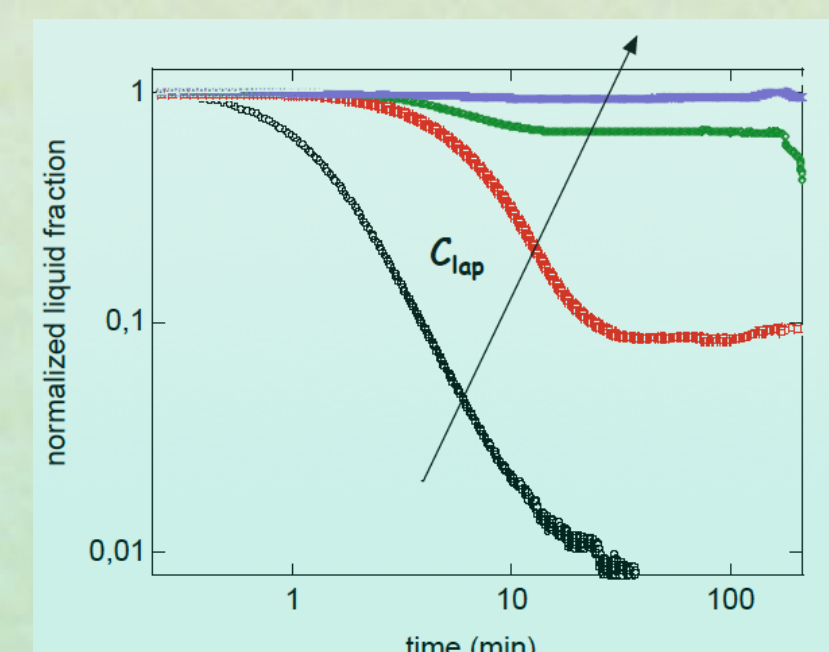
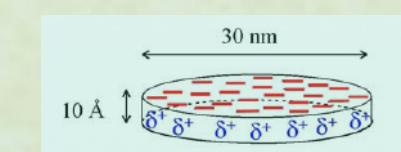
Soluble but permanently adsorbed stabilizers
silica -partially hydrophobic - nanoparticles



Melting of proteins as enhanced stabilizers (FoodHydrocolloids 2009,2010)

Routes to stop drainage: complex fluids

Clay particles (Laponite) + SDS

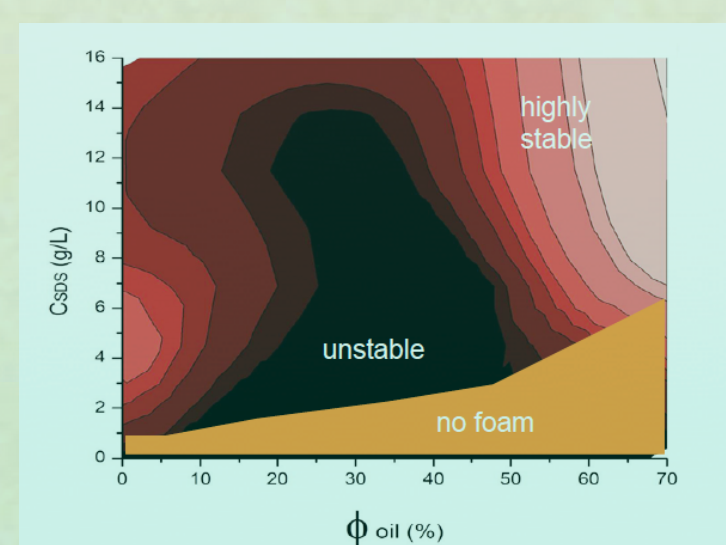


Foam aging + laponite aging: confinement in channels

Flox arrest : jamming Below the yield stress (Soft Matter 2009)

Doping with soft particles: « Foamulsions »

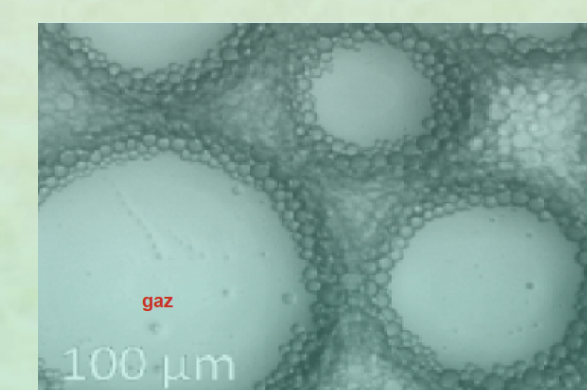
Adding oil droplets in continuous phase: foamulsions. from unstable to highly stable



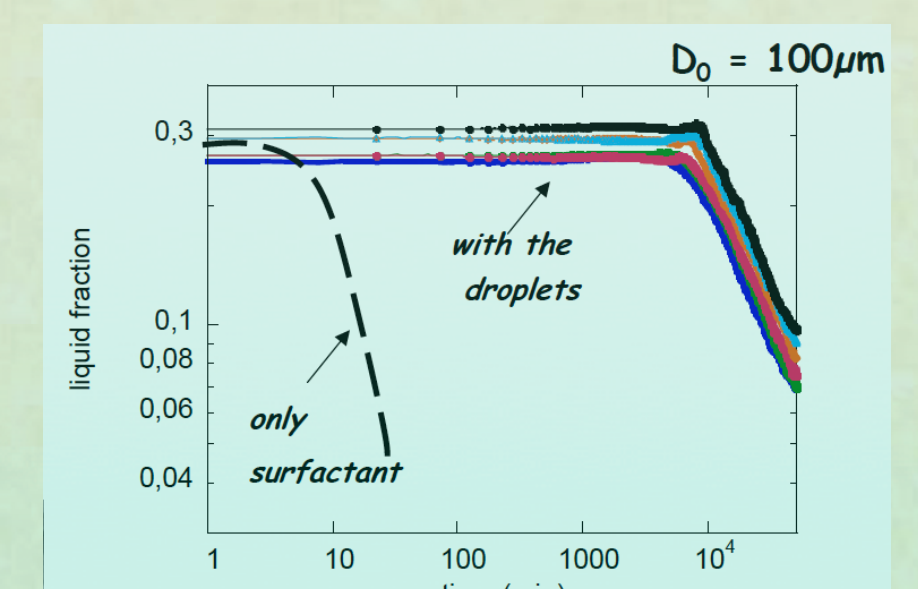
Depend of surfactant, concentration, fraction and oil nature

Dual dispersions: highly stable materials

Drainage/coarsening drastically stopped

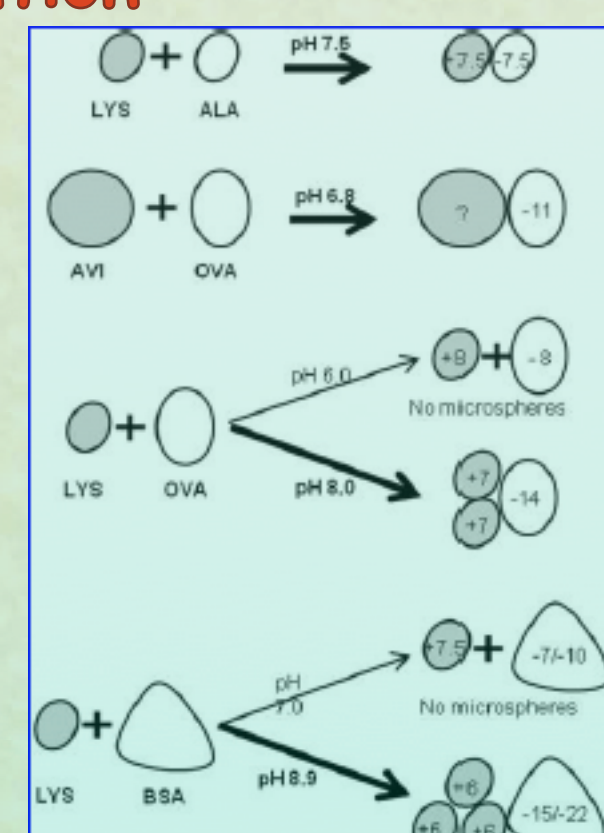
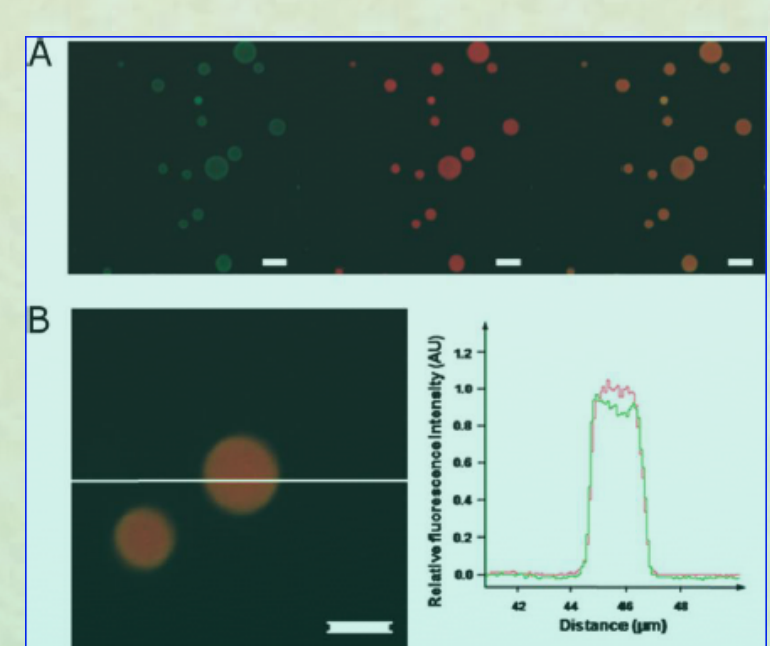


Soft Matter 2012



Couples of proteins form microspheres

Microspheres formed with oppositely charged proteins
Incubation conditions (30 min at 45°C)
Narrow size distribution

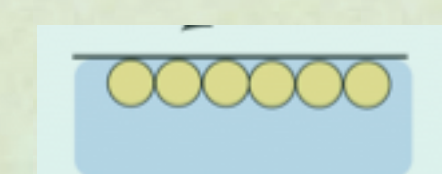


Biochemistry 2007
J. Phys. Chem 2010
Biomacromolecules 2012

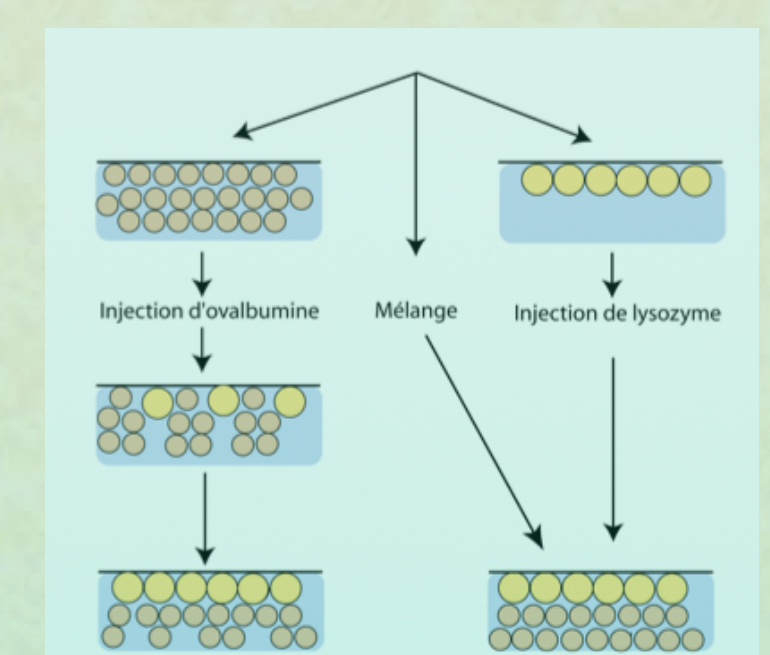
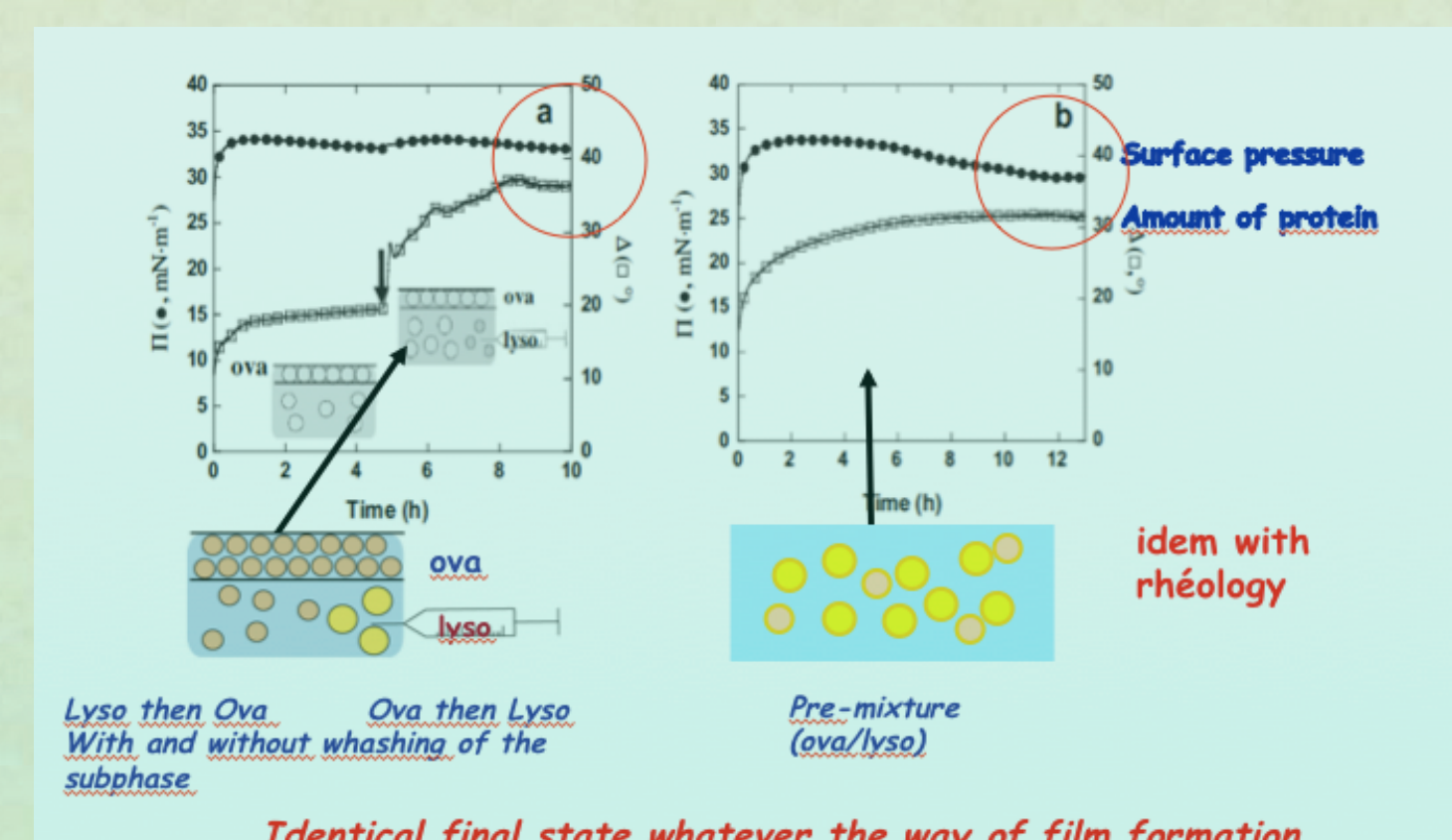
At pH 7.0
Positively charged: Ovalbumine, BSA, AlphaLactalbumine
Negatively charged: Lysozyme, Avidine

Control of interface thickness

Ovalbumine alone: monolayer

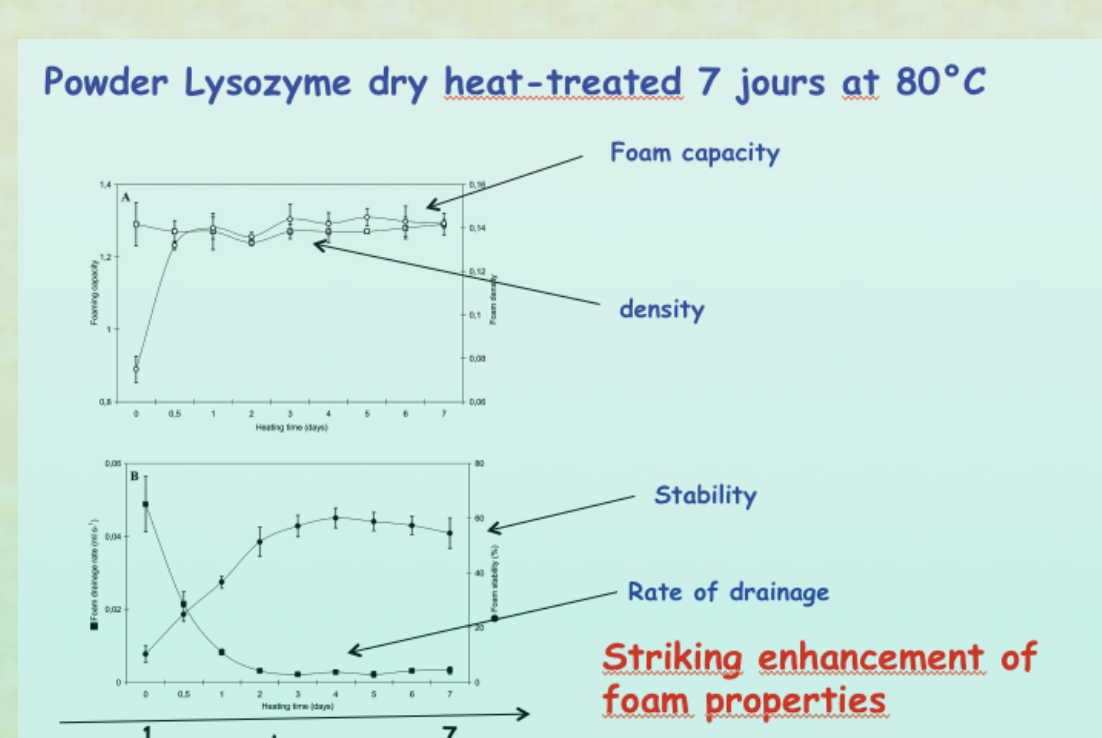


Mixture Ovalbumine/Lysozyme: multilayers and stratification



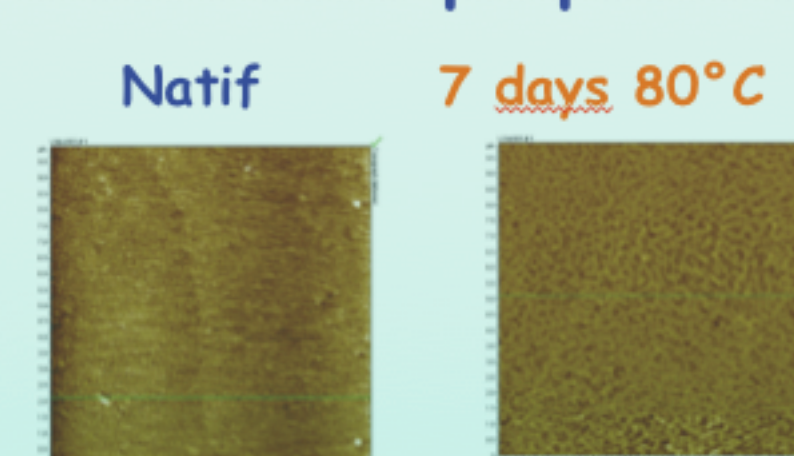
FoodHydrocolloids 2009,2010

Small structural modifications : a switch to control foam stability



« small » structural modification- huge impact on foam properties
Langmuir 2011

Interfacial properties



	native	dry-heated
π (mN m ⁻¹)	17.1	23.7
Δ (°), 8 h	14.0	31.2
Δ (°), 15 h	14.0	38.0
thickness (nm)	2-3	80-100