
SOFT MATTER

EMULSIONS

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REPORTS PLAN

- - creation methods
- - quantification
- - deformation properties
- - flow properties
- - application

EMULSIONS IN DAILY LIFE



Vinegar



Some types of cosmetics



Oil

Also emulsions!

EMULSIONS IN SCIENCES

- Classification: $\frac{Oil}{Water}$ – *direct emulsion*, $\frac{Water}{Oil}$ – *reverse emulsion*
- Flocculation – a two-step process, when small particles stick together and form larger particles

CREATION AND STABILIZATION

- We can stabilize emulsions with surfactants!
- Surfactants can create a steric barrier around each particle



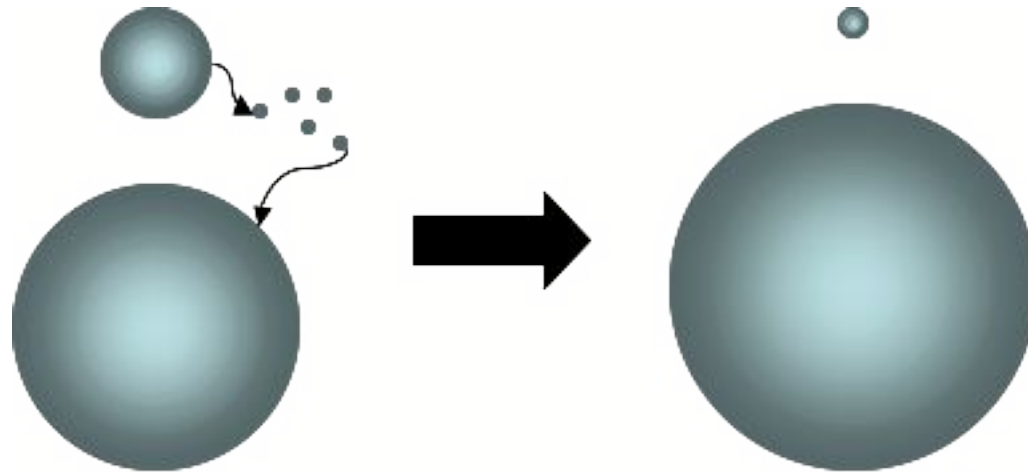
Marangoni effect

DESTRUCTION AND DESTABILIZATION

- Types of emulsion destruction:
 - - physical (aggregation and phase separation)
 - - chemical (change acidity index)
 - - with help of biological microorganisms
 - - creaming

COARSENING

- Ostwald ripening cause a masses redistribution from small particles to large



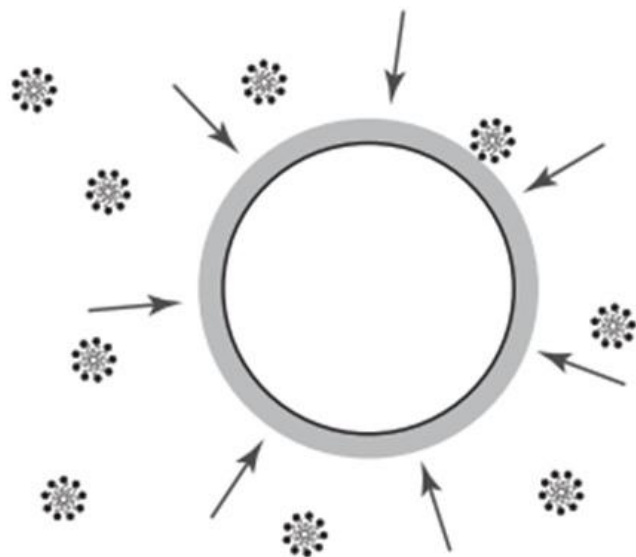
PURIFICATION: CREAMING AND DEPLETION

- Monodispersy and how to achive it?
- Let's fractionate the emulsion!

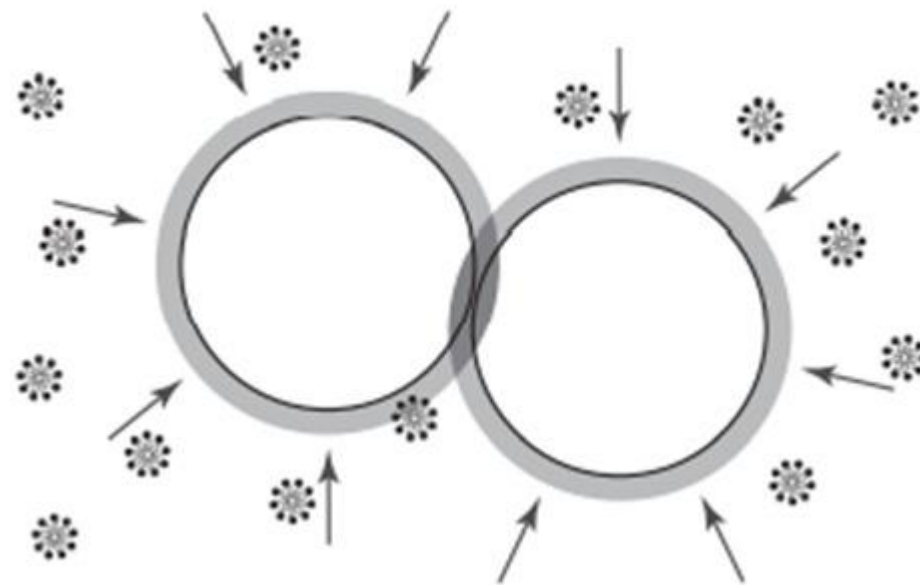
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$$F = \rho g V$$
$$v = \frac{(p_w - p_o) g d^2}{18 \mu}$$

MICELLES



One droplet surrounded by micelles



Overlap of excluded volumes

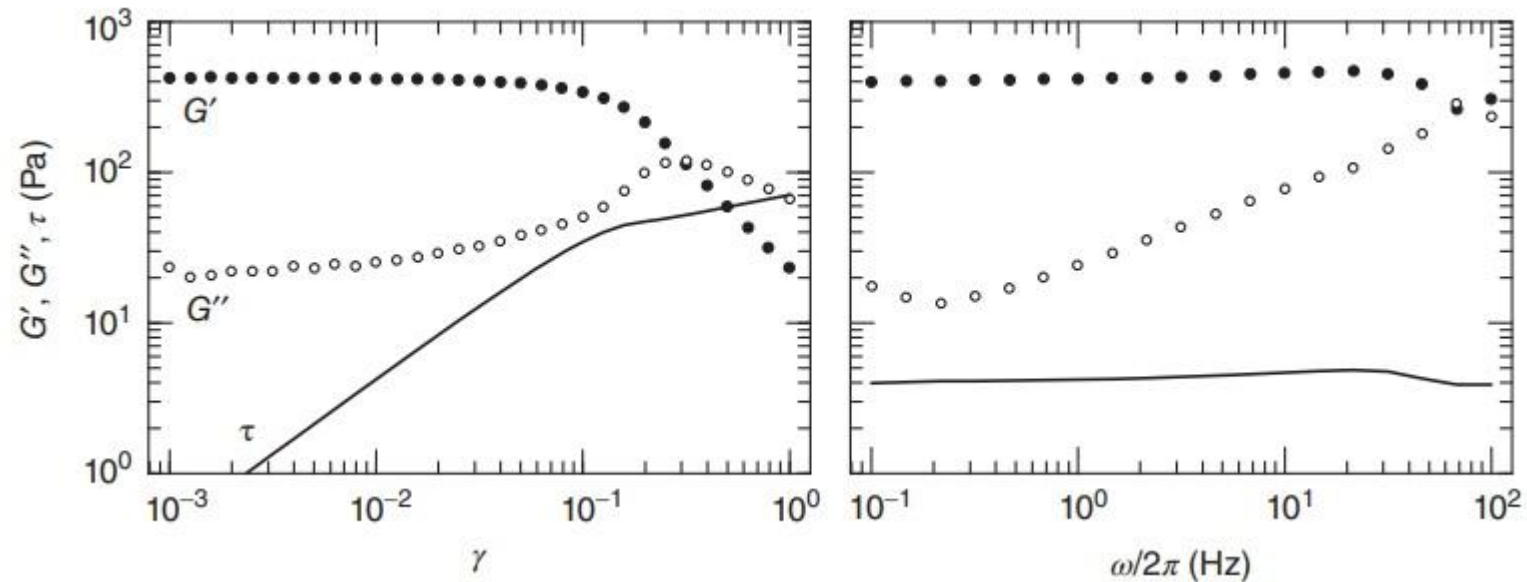
$$U = -\frac{3}{2} k_B T \phi_m \frac{d}{d_m}$$

EMULSIONS BASED ON MICROFLUIDS

- We can create emulsions based on microfluids!
- Realize using hydrodynamic focusing

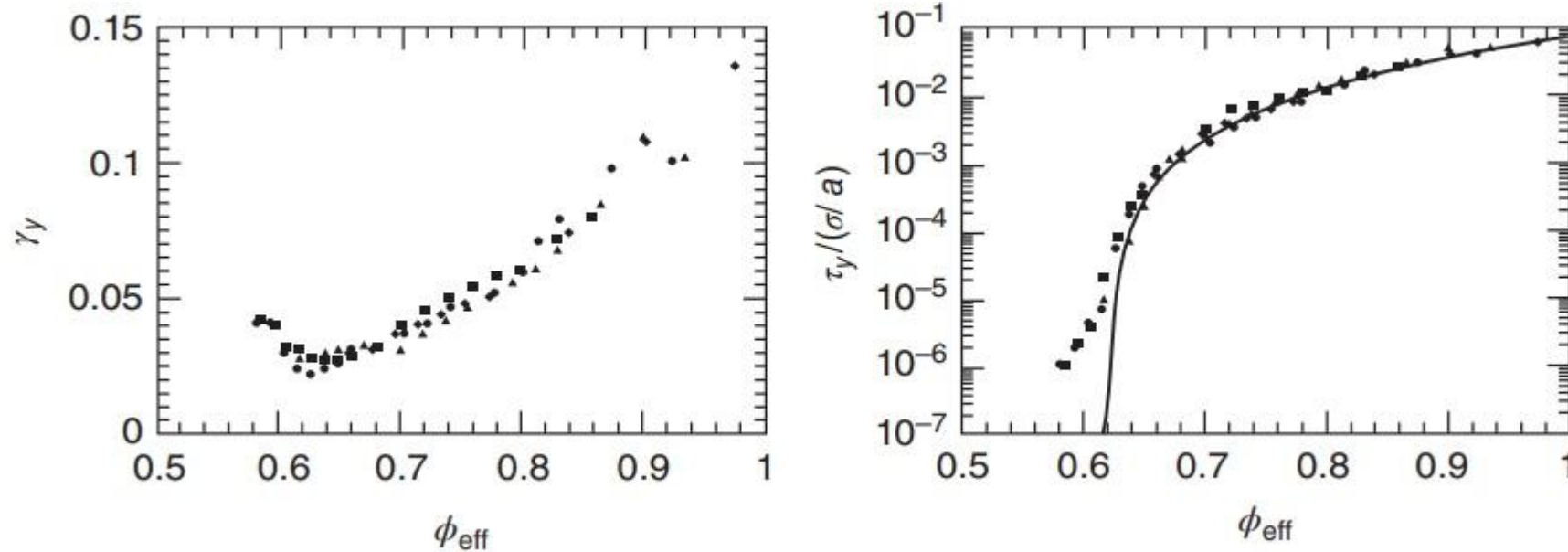
DENSE EMULSIONS AND JAMMING

- A disordered suspension of colloid particles can exhibit a huge range of mechanical properties!
- Jamming state



Dependence of tension and dynamic memory module on strain amplitude and frequency

YIELD MEASUREMENTS

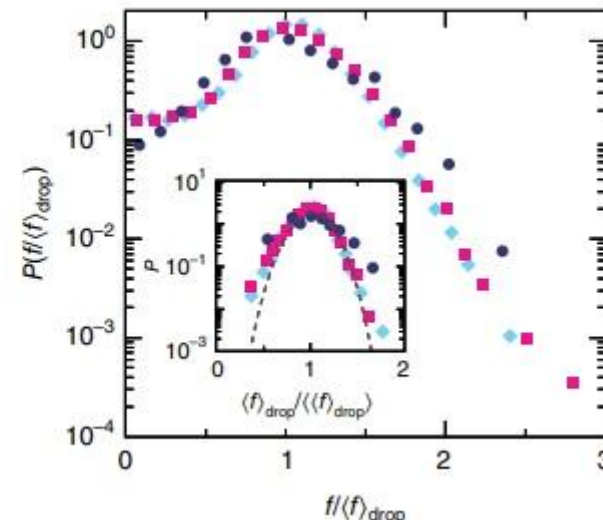
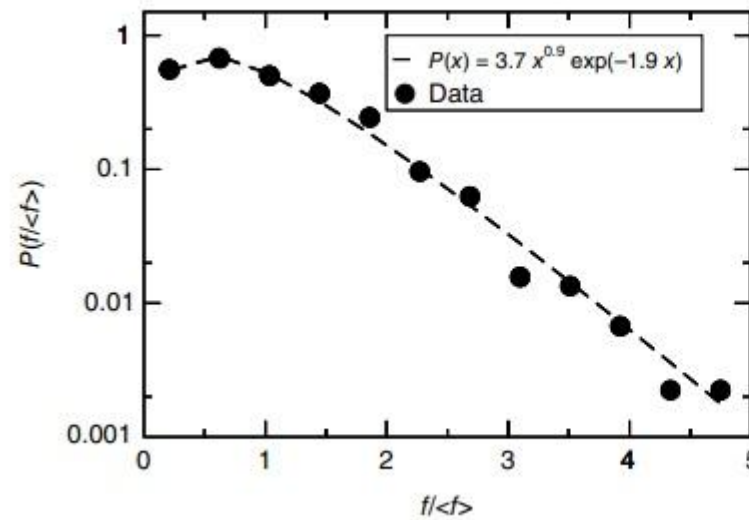


The dependence of yield strain and yield stress on phase volume

LITTLE MORE ABOUT THE JAMMED STATE

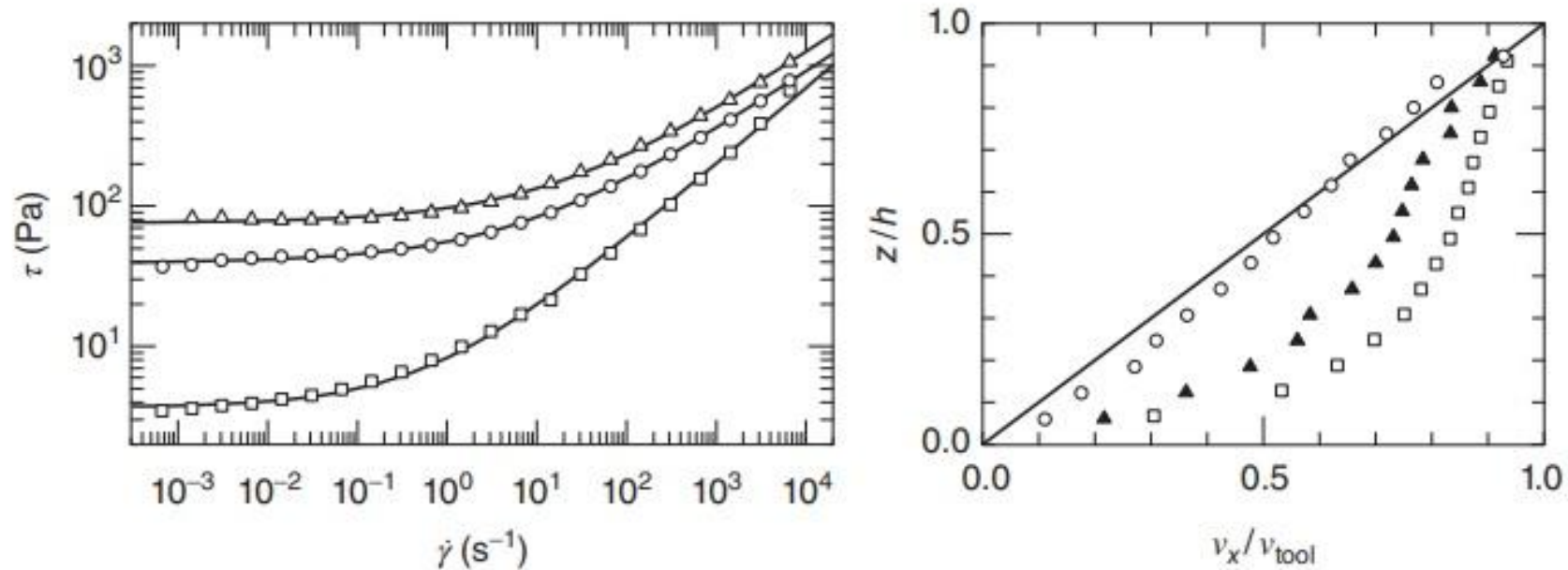
- In a jammed state the colloidal system can be under load.

$$f = \left(\frac{2\sigma}{d} \right) A$$



Measurement of force change by analysis contact patches

THE FLOWING STATE



The dependence of shear stress on shear rate and shear rate on shear levels positions.

TOTAL

- The creating and development of emulsions and liquid colloids are very important subject.
- I hope my brief report gave you a general idea of emulsions and how to work with it.