SOFT MATTER

EMULSIONS

Created by Zakharchuk I.A.
Group FN4-81B
Scientific advisor: Yurchenko S.O.

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!

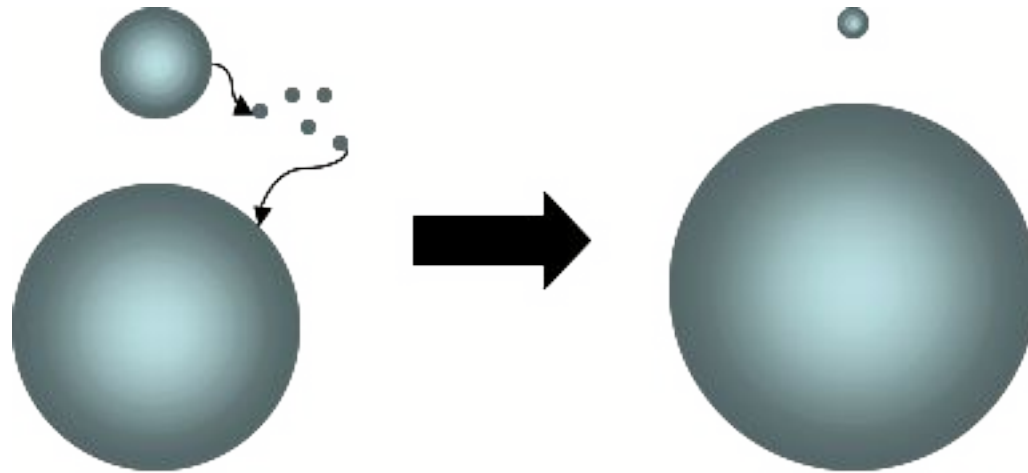- Surfactants can create a steric barrier around each particle

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

- Ostvald ripening cause a masses redistribution from small particles to large
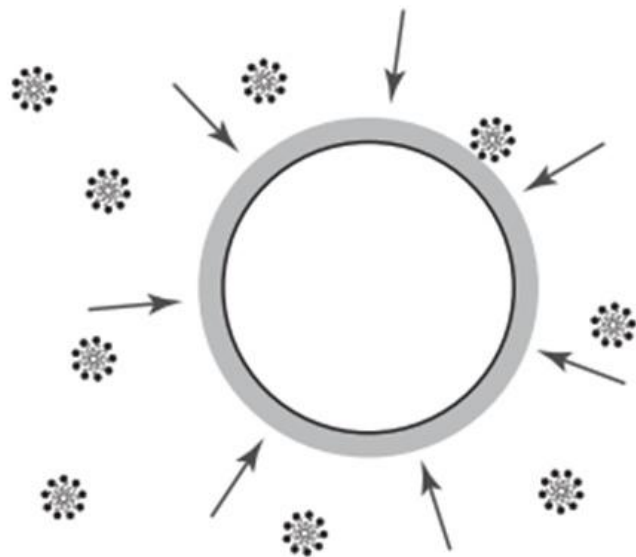
PURIFICATION: CREAMING AND DEPLETION

- Monodispersy and how to achive it?

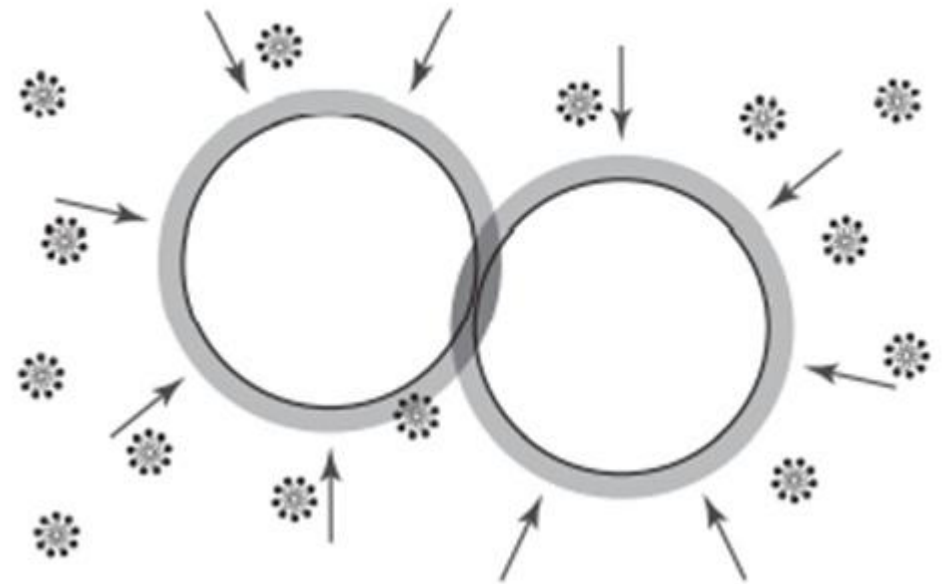- Let's fractionate the emulsion!

-

$$F = \rho g V$$

$$v = \frac{(p_w - p_o)gd^2}{18\mu}$$

MICELLES

One droplet surrounded by micelles   Overlap of excluded volumes
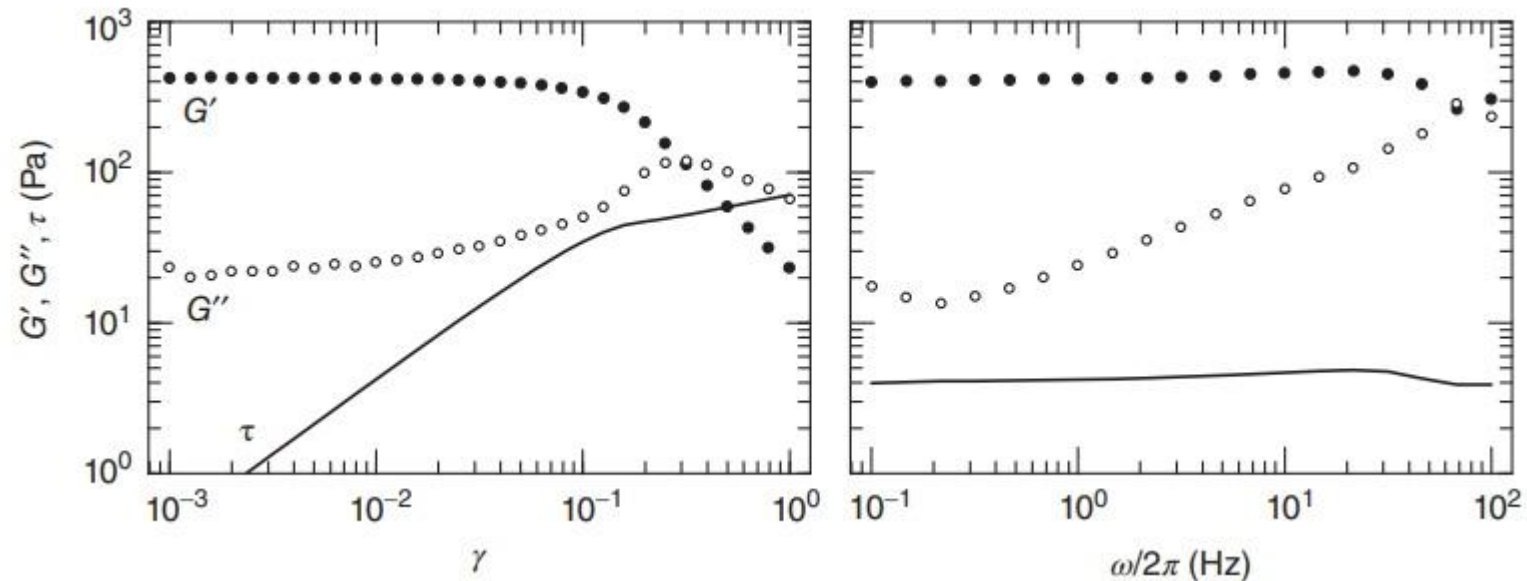
$$U = -\frac{3}{2}k_B T \phi_m \frac{d}{d_m}$$

EMULSIONS BASED ON MICROFLUIDS

- We can create emulsions based on microfluids!

- Realize using hydrodynamic focusing

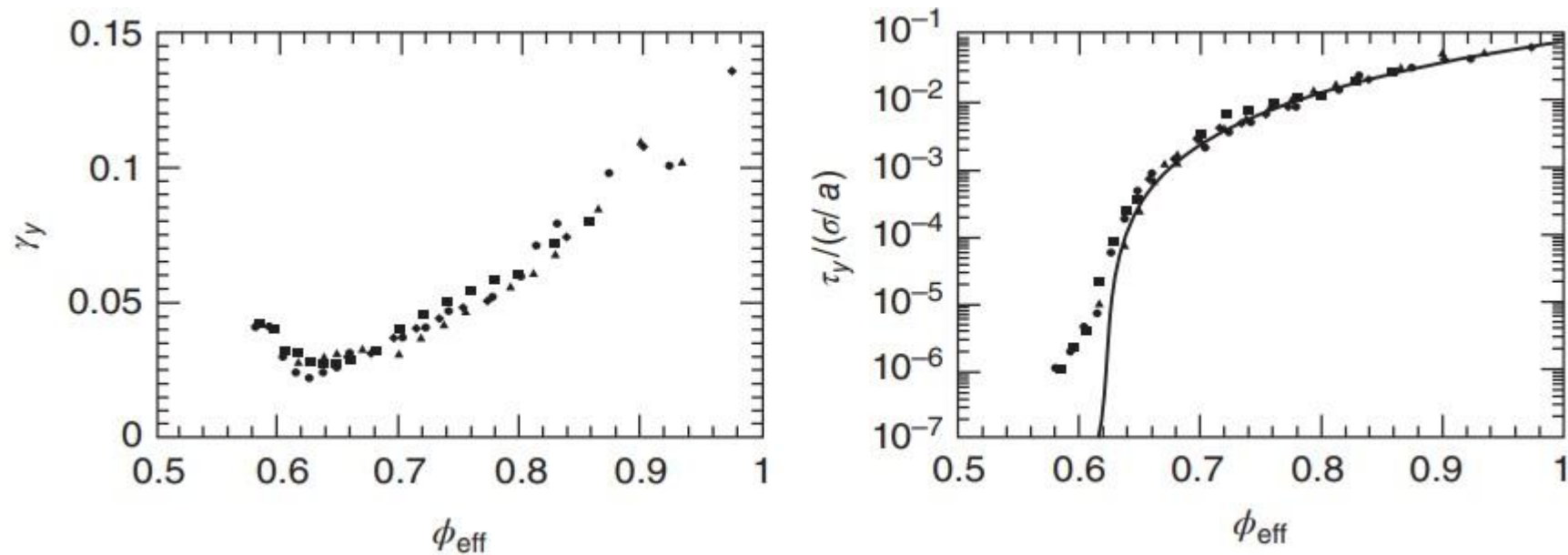# DENSE EMULSIONS AND JAMMING

- A disorded 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
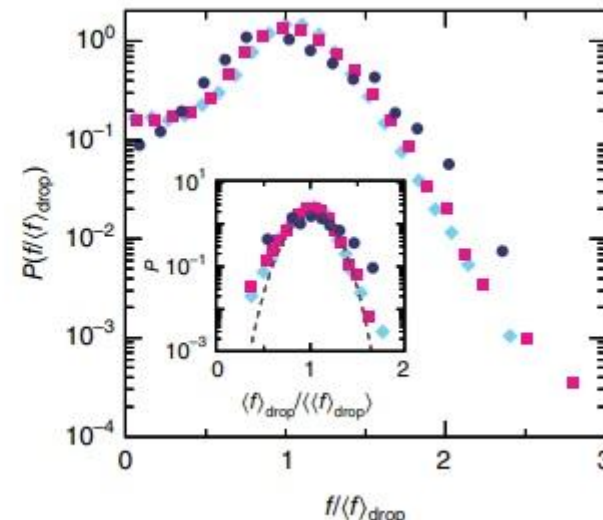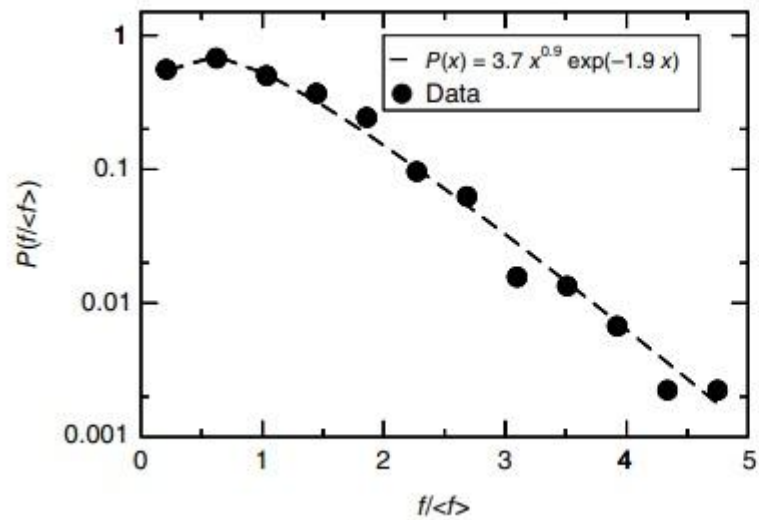
YIELD MEASUREMENTS

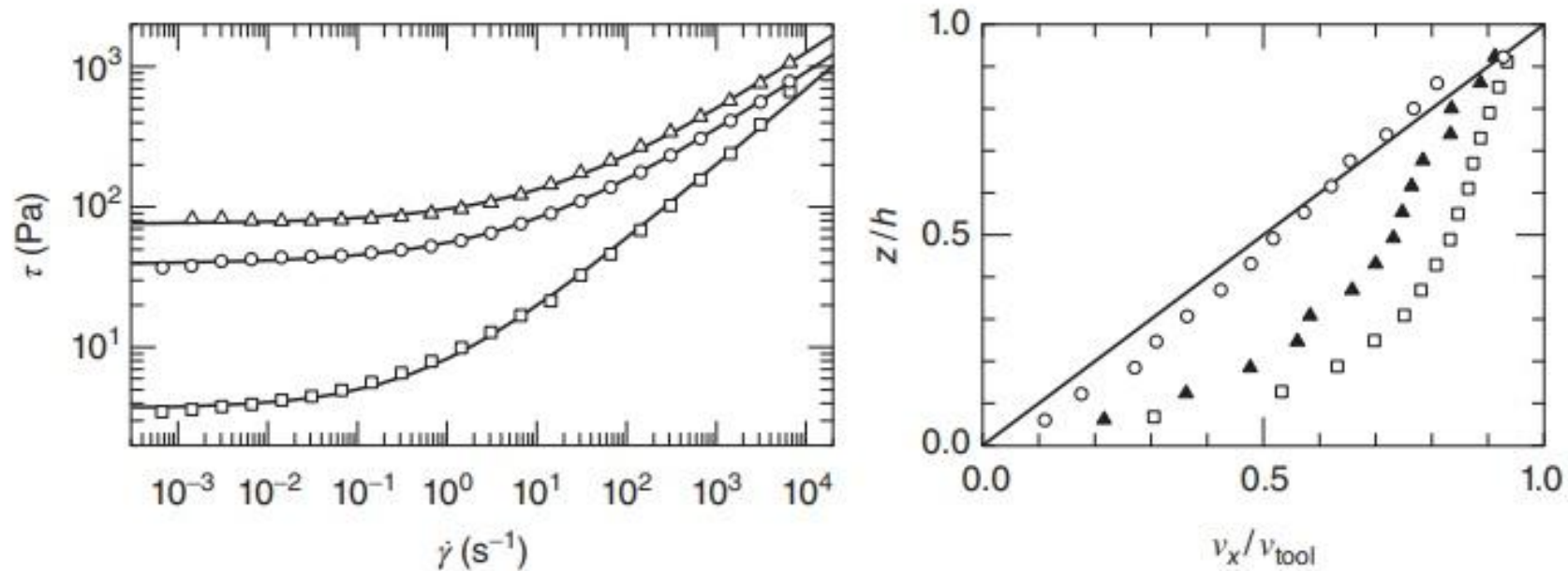The dependence of yield strain and yield stress on phase volume

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

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

Measurment 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.