UE Complex fluids

Niveau d'étude
Bac +5

ECTS
3 crédits

Composante
UFR Physique, Ingénierie, Terre, Environnement, Mécanique (PhITEM)

Période de l'année
Automne (sept. à dec./janv.)

Diplômes intégrant cet élément

- Master Nanosciences et nanotechnologies

Langue(s) d'enseignement: Anglais
Ouvert aux étudiants en échange: Oui
Code d'export Apogée: PAX9NFAE

Présentation

Description

Goal

Complex fluids are mixtures of different materials and fluids. Usually, we consider the coexistence between two phases: solid–liquid (like suspensions or solutions of polymers, proteins or DNA), solid–gas (like granular materials), liquid–gas (like foams) or liquid–liquid (like emulsions). Complex fluids exhibit unusual mechanical responses to applied stress or deformation. The mechanical response includes non-linear behaviors such as shear thinning or shear thickening as well as large fluctuations (elastic turbulence). The mechanical properties of complex fluids can be attributed to characteristics such as polymer unfolding, caging, or clustering on multiple length scales. The course deals mainly with two kinds of complex fluids: polymer fluids and suspensions.

Content:

1. Introduction to Complex fluids in nature and in industry
2. Conservation laws. Matter, Momentum and Energy

Informations non contractuelles.
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3. Standard flows (Poiseuille flow, Couette flow).
4. Dissipation
5. Polymer fluids

- Non-linear fluids and shear dependent viscosity
- Normal stresses and Weissenberg experiment
- From nano to macro: starting from a polymer chain to macroscopic properties

6. Suspensions

- Rheology
- Homogenization
- Taylor dispersion
- Active suspension (natural and artificial nano and micro-swimmers)

Heures d'enseignement

CMTD	Cours magistral - Travaux dirigés	22,5h

Pré-requis recommandés

Basis in hydrodynamics

Période : Semestre 9

Bibliographie

Dynamics of polymeric liquids, B. Bird, vol 1 & 2, John Wiley & Sons Ed. 1987
The structure and Rheology of Complex Fluids, Ronald Larson, Oxford Univ. Press, 1999

Infos pratiques

Campus

Grenoble - Domaine universitaire

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