Coalescence Rupture Aggregation

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Code:** N9EM16C
- **Open to exchange students:** No

Presentation

Objectives

Provide future engineers with a basic understanding of the physical mechanisms controlling the structure of interfaces in dispersed media: bubble flows, emulsion flows and flows with aggregates. Develop appropriate models for calculating the spatio-temporal evolution of bubble/drop/particle populations in two-phase processes.

Description

I- Introduction to dispersed media engineering: Application examples (emulsification, precipitation, filtration) - Transfer coefficients - Interfacial area - Size distribution functions and their moments.

II- Modeling population evolution using population balance equations: source and sink terms.

III- Application: particle aggregation kernel by Brownian or shear-induced agitation.

IV- Gas-liquid and liquid-liquid interfaces: interfacial tension, effects of surfactants, consequences for interfacial phenomena.

V- Rupture: physical problem and models for population balances (fragmentation nuclei for bubble and droplet flows), (i) in viscous, (ii) inertial and (iii) turbulent flow. Examples of applications for breaking bubbles in stirred tanks or drops in emulsification processes.

VI - Coalescence: description of the physics, focus on the hydrodynamics of film drainage between bubbles or drops, models for population balances. Application examples and limits of these approaches.

BE: modeling the evolution of the size distribution of a population in a given two-phase process: physical analysis of the mechanisms, establishment of simple models and simulation of the output size distribution as a function of hydrodynamics.