Transfers in two-phase and turbulent media

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Code:** N9EM07C
- **Open to exchange students:** No

Presentation

Objectives

This course introduces the transfer mechanisms observed in turbulent two-phase flows.

The first part of the course recalls the similarities and differences between mass and heat transfer. In the context of dispersed flows, it describes the transfer laws (Sherwood and Nusselt numbers) at the scale of bubbles, drops and particles. These concepts are applied to study oxygen transfer in a bubble column, either by injecting air bubbles or pure oxygen bubbles. The transfer equation is then derived in the context of 2-fluid approaches.

The second part of the course deals with transfer in turbulent flow. The notions of thermal and mass boundary layers in turbulent flow are presented. The statistical description of mixing in homogeneous turbulence is presented, along with the scaling laws that characterize it and their dependence on Reynolds and Schmidt/Prandtl numbers. Finally, these concepts are applied to the estimation of mixing in partially premixed reactors.

Description

Introduction: examples of industrial and environmental applications -

I. Analogies and differences between mass transfer and heat transfer. Nusselt and Sherwood numbers

II. Transfers on the scale of fluid particles (bubbles and drops). Demonstration of generic scaling laws as a function of the nature of the interface.
III. Application to oxygen transfer in a bubble column

IV. Analysis of experimental transfer measurements in a bubble column.

V. Introduction to the concepts of mixing in turbulent flows.