Faculty of Applied Sciences

MAPR1400   Applied Kinetics

[30h+30h exercises] 5 credits

This course is not taught in 2005-2006
This course is taught in the 2nd semester
Language: French
Level: First cycle

Aims

The main objective of the course is to familiarize the students with the kinetics of physical and chemical transformations. Knowing the rates of these transformations is of prime importance for modelling and design of chemical processes. The identification of rate laws in typical cases is described and the meaning of the different parameters on a molecular level is pointed out.

Main themes

The course is divided in two parts. The first part (2.5 ECTS) is devoted to the basic elements of chemical and physical kinetics, their interdependence as well as their relationship with thermodynamics.
The second part (2.5 ECTS) derives the rate equations for complex reactions (in parallel, in series, reversible and heterogeneous) and explains how they are incorporated in the ideal reactors models.

Content and teaching methods

Content :
Part 1 :
- Basics of chemical kinetics : formal kinetics ; experimental methods for kinetic analysis ; physical and thermodynamical basis (1 ECTS)
- Important examples of homogeneous and heterogeneous reactions : chain radical reactions ; enzymatic catalysis ; surface catalysis (0,5 ECTS)
- Kinetics of physical phenomena : phase transformation by nucleation and growth (Avrami) ; diffusion of heat and matter (Fick's et Fourier's laws) (1 ECTS)
Part 2 :
- Formal kinetics of complex reactions: in parallel, in series, and reversible reactions. Derivation of the rate equations and experimental methods of acquisition.
- Kinetics of heterogeneous reactions and properties of industrial catalysts. Derivation of the different rates following the adsorption models.
- The use of rate equations in the basic ideal reactors equations (batch, plug flow and CSTR)
Methods :
Ex-cathedra courses and exercises.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Not applicable