



# Faculté des sciences appliquées

## FSA

MAPR2380 Solid-fluid separation

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

**Teacher(s):** Pierre Adam, Denis Mignon  
**Language:** french  
**Level:** 2nd cycle course

### Aims

Study of fluid flow through porous media and introduction to unit operations for solid fluid separation, crystallization in particular.

### Main themes

Study of the crystallization/precipitation techniques :

- Crystalline state, crystal lattice and polymorphism.
- Phase equilibrium.
- Crystallisation kinetics (seed formation and crystal growth).
- Practice and instrumentation.
- Industrial applications.

Theoretical fundamentals for the solid fluid separation techniques

- Physical properties of liquids and solids: porous media characterisation (particles size, shape and distribution, porosity); introduction to surface tension
- Fluid flow through porous media: model of Kozeny-Carman; laws of Kozeny, Burke-Plummer, Ergun; co-current two-phase flow

- Settling of particles through fluids: laws of Stokes, Allen, Newton

Solid fluid separation techniques

- Sedimentation, centrifugation, cyclone, hydro cyclone
- Washing and deliquoring of cakes
- Filtration: sieving, cake filtration, clarification, deep bed filtration
- Membrane filtration: micro-, nano-, ultra-filtration, reverse osmosis, crossflow filtration, diafiltration

### Content and teaching methods

The first part of the course is dedicated to the study of crystallization and its operating principles : equilibrium between phases, sizing methods, industrial applications and equipment. The theoretical considerations will be illustrated by practical work sessions relying on the use of the process simulation software ASPEN+.

The second part of the course is dedicated to the solid fluid separation techniques. Those techniques have been grouped in the four categories described here above. For each of them, the study will be done as follow:

- Description and phenomenological study
- Modelization and sizing
- Description of industrial equipments and main applications

Practical work sessions will illustrate those aspects.

### Other credits in programs

<b>INCH22</b>	Deuxième année du programme conduisant au grade d'ingénieur civil chimiste	(5 credits)	Mandatory
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