



MASTER

CHEMISTRY

Specialization

Solid-State and Crystallization

(S2C)



OBJECTIVES

The specialization Solid-State and Crystallization proposed in the Master of Chemistry at the University of Rouen Normandie is **unique in France**.

This formation proposes a multi-disciplinary training based on a **fundamental and applied** approach of the **CRYSTALLIZATION process and the description of the solid-state**.

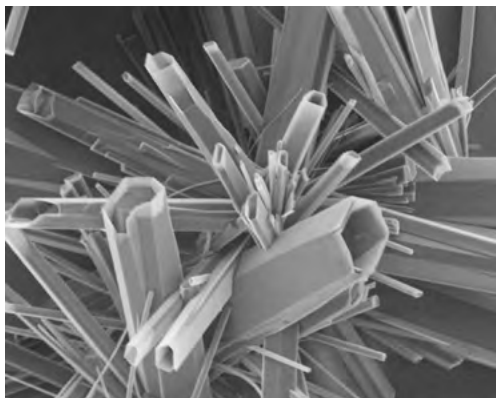
This complex physico-chemical process is central to **separation operations, purification or fabrication of materials with controlled properties** in various industrial fields (fine chemicals, pharmaceutical industry, semi-conductors, cosmetics, inorganic materials, ...).

The graduated student will possess the theoretical and experimental knowledge allowing him/her to understand classical methods of crystallization and design new ones suitable for the considered materials and the targeted applications.

ADMISSION CONDITIONS

Admission in first year of Master (M1)

- For students who obtained their bachelor degree (Licence) in a French or foreign university in chemistry, physical chemistry, physics or an equivalent degree, the admission is subjected to the evaluation of an application file by a validation commission.



TARGETED SKILLS

The Master of Chemistry - specialization **Solid-State and Crystallization** will enable the students who follow this training to:

- Understand the fundamental mechanisms involved in the phenomenon of crystallization
- Acquire the fundamental and practical knowledge for analyzing and describing the solid state
- Get a multi-disciplinary knowledge of the crystallization process and manufacture of solid materials
- Be familiar with industrial crystallization processes (separation, purification, final processing)
- Propose and design crystallization methods suitable for a given issue.



Admission in second year of Master (M2)

- Direct admission for Students who validated their M1 Chemistry at the University of Rouen Normandie.
- Subjected to the evaluation of an application file by a validation commission for:
 - Students who validated a M1 Chemistry or M1 Chemistry and Materials Sciences in another French University.
 - Students in French School of Engineering who are willing to follow a double cursus during their fifth year.
 - Students from foreign Universities who justify of getting knowledge and skills equivalent to those obtained in a M1 Chemistry of M1 Chemistry and Materials Sciences.
 - Employees from industry who are willing to obtain a degree equivalent to the M2 via a "VAE" or the "formation tout au long de la vie" (in the framework of the personal training account). Only employees of French companies are eligible to these training options.

PROGRAMME AND CONTENTS

M1

Semester 1

Common courses : 4 choices among 5 UE (4 x 6 ECTS)

- Organic chemistry
- Polmer physico-chemistry
- Analytical chemistry
- Inorganic solid chemistry
- Chemical Physics and technology

Scientific and societal Issues, sustainable chemistry : 2 choices among 3 (2 x 1 ECTS)

- Chemistry for life and health
- Chemistry and energy
- Chemistry and sustainable development

Transversal skills : (4 ECTS)

- English
- Professional project

Semester 2

Specialization (12 ECTS): 1 choice among 4

- Inorganic chemistry / Crystallization: Inorganic and organic crystallized materials / Fundamentals of Crystallization
- Polymer chemistry: Polymeric materials-dispersed systems/Natural macromolecules and applications
- Organic Chemistry: Synthesis methodology / Organic synthesis strategy
- Analytical chemistry: Spectroscopic methods/ Mass spectroscopy

Personnalization: 2 choices among 8 propositions (2 x 6 ECTS)

- Inorganic and organic crystallized materials
- Fundamentals of Crystallization
- Polymeric materials-dispersed systems
- Natural macromolecules and applications
- Synthesis methodology
- Organic synthesis strategy
- Spectroscopic methods
- Mass spectroscopy

Bibliographic project

- Internship (8 weeks in academic or industrial laboratory)

M2

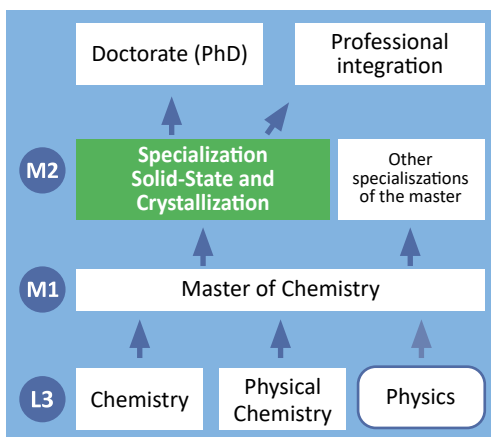
Semester 3

- Solid-state, preparation and characterization: Vibrational spectroscopy, Solid-State NMR
- Solid-State : Symmetry: Crystalline and molecular symmetries, Electronic microscopies (MET and SEM)
- Crystallization processes: nucleation/ growth, crystalline defects, crystallization methods, industrial crystallization, intellectual properties, bibliographic report. Courses delivered by academic and industrial researchers.
- Molecular crystals: Specificity of the solid-state, characterization methods, research project in laboratory.
- Chirality at the solid-state
- Physical characterization of amorphous and crystalline solids.

Possibility of hybrid courses by visioconferences

Semester 4

- Professional insertion
- Internship of six months in academic or industrial context.



LABORATORIES

Research laboratories associated to the Master of Chemistry specialization Solid-State and Crystallization (S2C):

Laboratoire Sciences et Méthodes Séparatives, UR 3233
<http://labsms.univ-rouen.fr>



Laboratoire de Cristallographie et Sciences des matériaux, UMR 6508
<http://www-crismat.ensicaen.fr/>



Laboratoire Polymères Biopolymères Surfaces, UMR 6270
<http://pbs.univ-rouen.fr/>



Laboratoire Catalyse et Spectrochimie UMR 6506
<http://www-lcs.ensicaen.fr/>



Laboratoire COBRA UMR CNRS 6014
<http://lab-cobra.fr/>

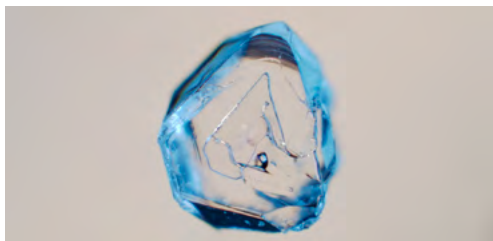


CAREER OPPORTUNITIES

Fields: pharmaceutical industry, fine chemicals, ceramics, cosmetics, agrochemical industry, mineral wastes treatment and valorization.

Positions in academia: research engineers, researcher, associate professor (after three years of PhD)

Positions in Industrial/private companies: executive, project or service leader, design or research engineers, consulting engineers/experts in the field of intellectual property.



Professors in charge of the Master

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Laboratoire SMS

Sciences et Méthodes Séparatives

<http://labsms.univ-rouen.fr>

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