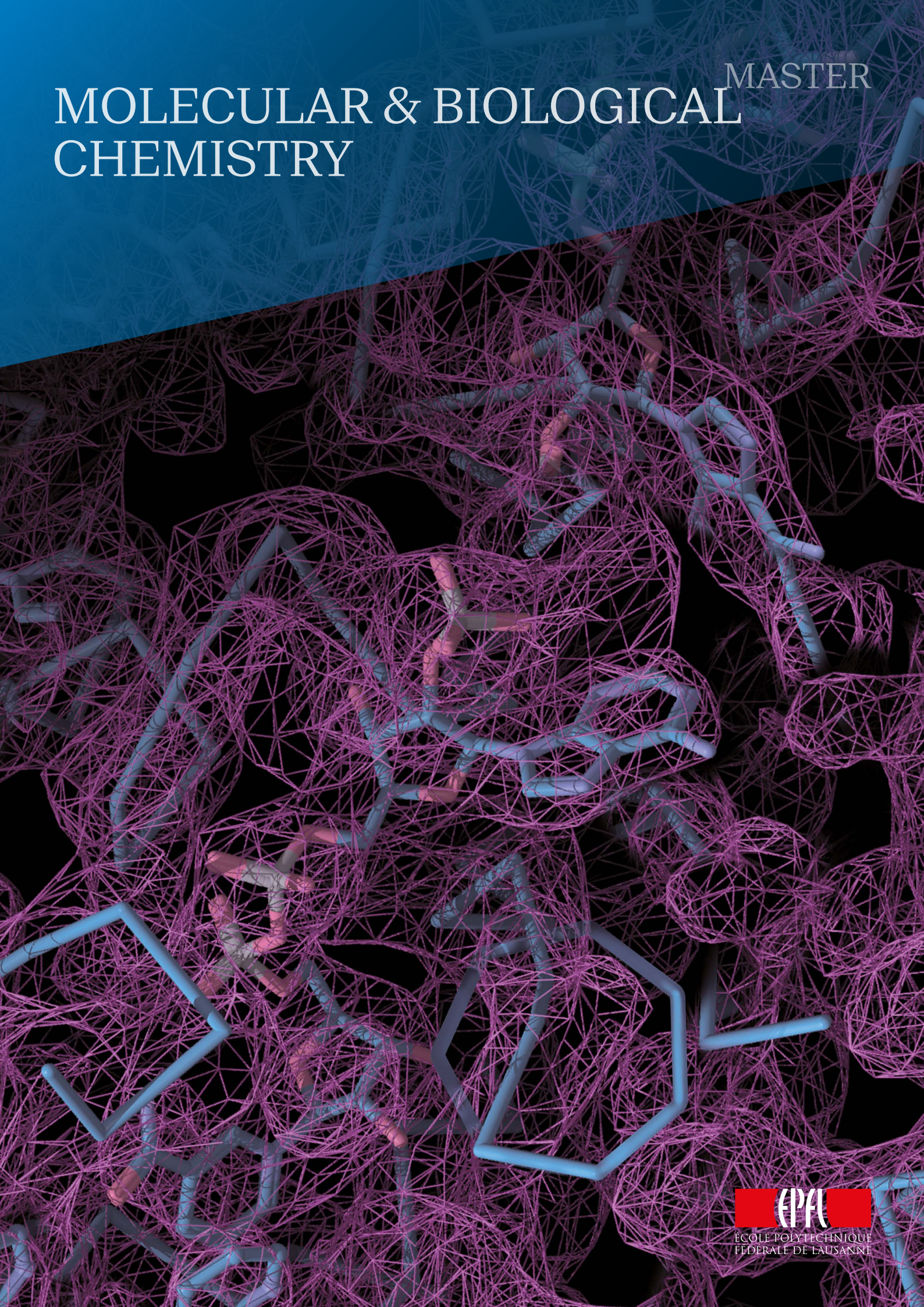
MASTER

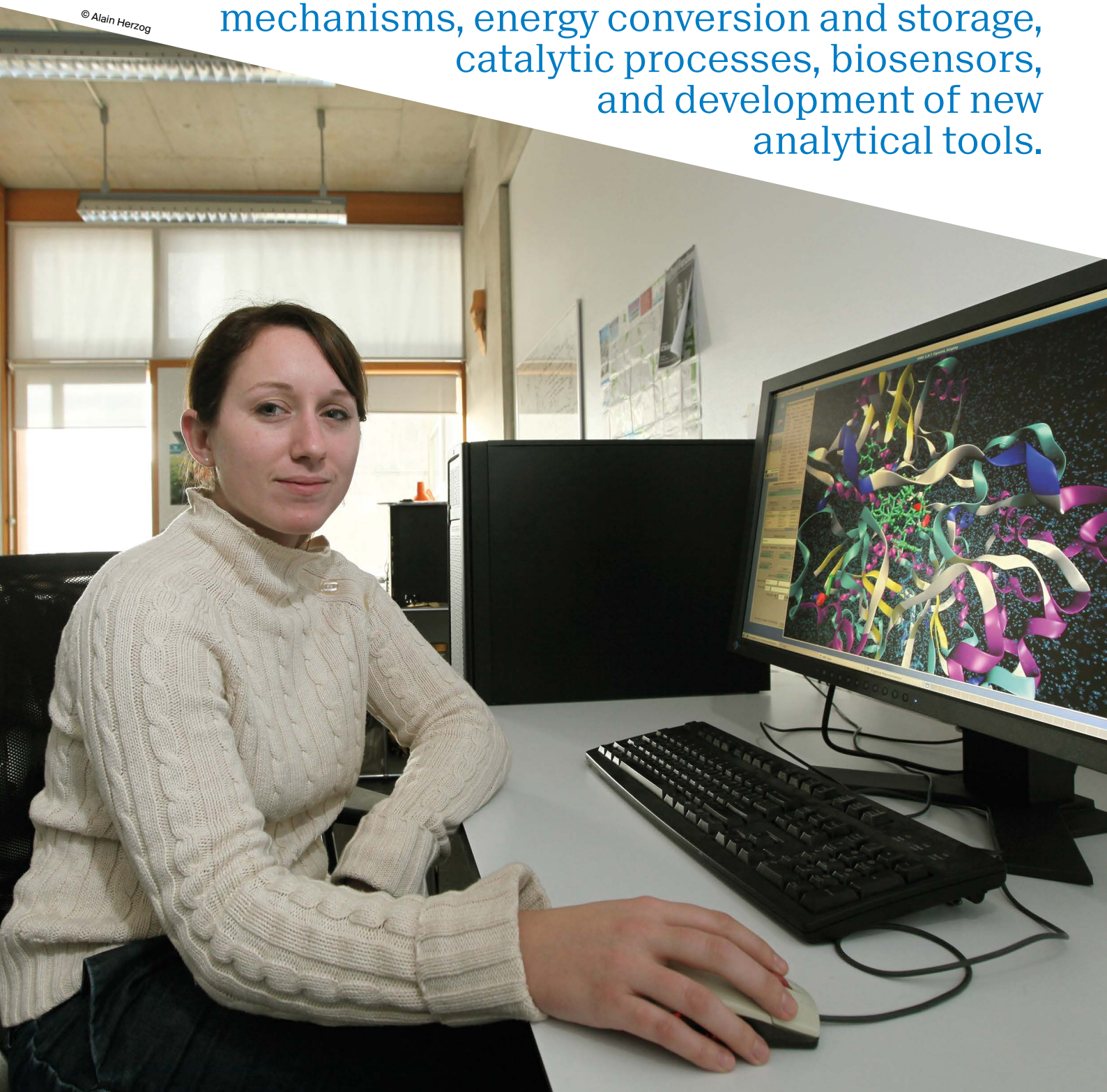
MOLECULAR & BIOLOGICAL CHEMISTRY

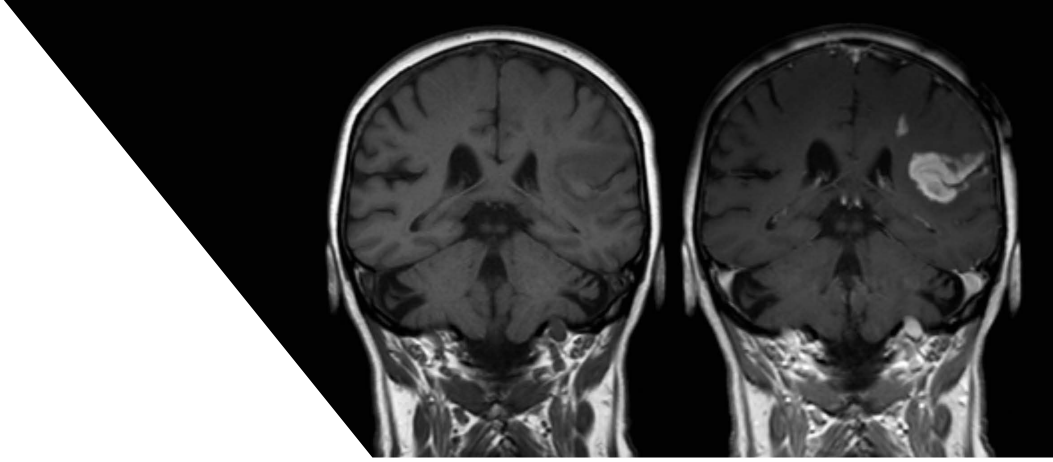


ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Molecules for Life and for Energy

Modern science is continuously leaning towards Chemistry. In Life Sciences, Materials or Environment, researchers realize that pertinent answers are hidden at the molecular scale. Amongst more than 30 research groups, our key activities aim to progress in fine molecules with biological interests, understanding of biological mechanisms, energy conversion and storage, catalytic processes, biosensors, and development of new analytical tools.





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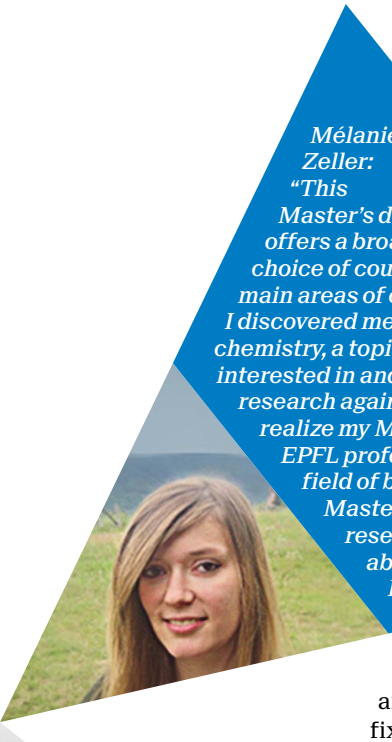


Mélanie Zeller: "This Master's degree offers a broad choice of courses in the main areas of chemistry. I discovered medicinal chemistry, a topic I'm very interested in and specifically research against cancer. I will realize my Master project with an EPFL professor who works in the field of biomolecular imaging. This Master is more oriented toward research and I'm thinking about doing a PhD."

Oligoprolines as MRI Contrast Agents - A Preliminary Study

Gaëlle Lapicorey

Magnetic resonance imaging (MRI) is an indispensable non-invasive clinical tool allowing 3D images of the body with high spatial resolution. It makes use of the property of nuclear magnetic resonance to image the nuclei of atoms inside the body. Contrast agents improve the contrast and the sensitivity using paramagnetic species as gadolinium. The contrast of the MRI image depends on the variation of relaxation for different tissues. Efficiency of contrast agents is measured in terms of relaxivity.

The aim of this project was to determine the relaxivities of two complexes of gadolinium composed of long rigid oligoprolines and gadolinium chelates of the common DOTA type. The oligoprolines are in this case composed of 19 or 20 single prolines which are amino acids present in humans. The two compounds differ only by the place where the chelate is fixed: For the first compound, it is fixed on the first proline of the chain whereas for the second one it is fixed on the middle of the chain. This different way of fixation will sense the motion of the rigid, stick-like molecule in different ways. This will help to design new and more efficient contrast agents in future.

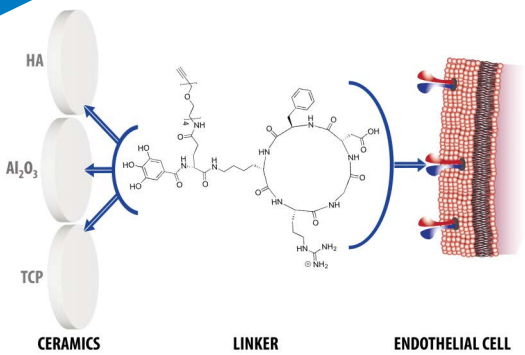
Watch the video:

Aleksandar Salim: "You can apply your knowledge everywhere. And it is fun! I take it as a game. Imagine yourself doing some problem solving, puzzling, all the time."

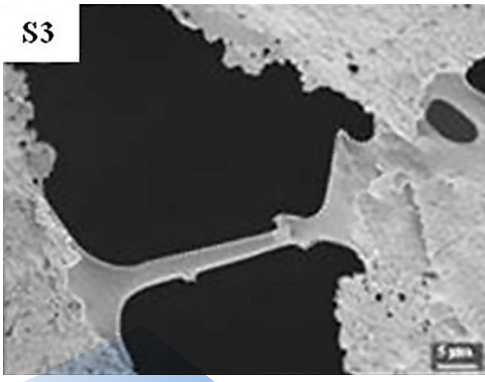
Towards the Functionalization of Bioceramics for the Developement of Bone Implants

Stéphanie Prior

This work aims to synthesize multi-functional ligands for surface modification of new synthetic bone scaffolds for synthetic grafts. They all have to be porous to match the bone's composition, can be made in diverse shapes and physical properties, and some can be resorbable, so that the bone remodelling will slowly replace the graft.



Depending on the patient's situation, permanent implants are also investigated. Ceramics bone implant matches all of those criteria.

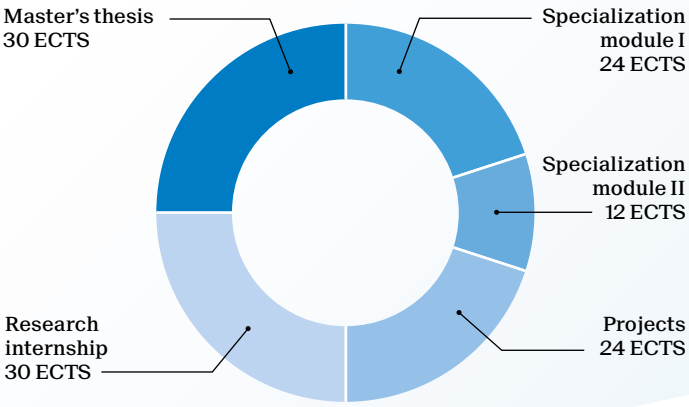


Cell adhesion to porous biomaterials

Master of Science in

MOLECULAR & BIOLOGICAL CHEMISTRY

2-year program - 120 ECTS



Students must choose 3 modules in Specialization modules I and 12 ECTS in Specialization modules II.

Students can opt for a 30 ECTS Minor instead of the research internship preferably in:

- Management, Technology and Entrepreneurship
- Science, Technology and Area Studies

	Credits
Specialization modules I	**24**
Bioanalytical chemistry	
Bioanalytics and analytical sensors	3
Mass spectrometry	3
Methodology in instrumental chromatography	2
Biological chemistry & biophysics	
Cellular signalling	2
Chemical biology	3
Nanobiotechnology and biophysics	3
Computational chemistry	
Applied molecular quantum chemistry	4
Computational methods in molecular quantum mechanics	4
Inorganic chemistry	
Catalysis for energy production	2
Catalyst design for synthesis	3
Inorganic reactivity	3
Organic chemistry	
Physical and computational organic chemistry	2
Structure and reactivity	3
Total synthesis of natural products	3
Physical chemistry	
Advanced NMR and imaging	3
Electronic spectroscopy	3
Photochemistry II	2
Specialization modules II	**12**
Risk management	2
Molecular and supramolecular science	
Artificial photosynthesis	2
Catalytic asymmetric reactions in organic chemistry	2
Chemistry of small biological molecules	2
Coordination chemistry and reactivity of f elements	
Pharmacological chemistry	2
Supramolecular chemistry	2
Physical and analytical chemistry	
Laboratory information management system (LIMS)	2
Molecular quantum dynamics	2
Photomedicine	2
Material science	
Advanced materials for photovoltaics and lighting	2
Analysis of ancient materials and their degradation	2
Introduction to nanomaterials	2
Organic electronic materials	3
Physical chemistry of polymeric materials	3
Polymer chemistry and macromolecular engineering	3
Food science	
Chimie des denrées alimentaires	2
Chemistry of food processes	2
Projects	**24**
Interdisciplinary / disciplinary project	6
Project in molecular sciences	12
Project in human and social sciences	6
Research internship	**30**

School of Basic Sciences
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