

# *Molecular and Materials Chemistry directed towards Living Sciences*

S. Ducki, S. Faure (coordinator), M. Lemaire, J.-M. Nedelec, V. Prévot, V. Sautou

## **Introduction**

This course, offered to the students of the Doctoral School of Fundamental Sciences, will provide a contemporary presentation of some of the most active research fields in molecular and materials sciences connected to the life sciences. Main themes of this course are: Chemistry to understand living systems, Chemistry to modify living systems and Biomimeticism & bioinspiration. These themes will be addressed through six lectures given by researchers from different fields of Chemistry.

## **Audience**

The lectures will be designed to be accessible to *non-chemists* (PhD students from all areas of fundamental science) and complementary for *chemists* while contributing to the build-up of the general scientific knowledge of both audiences. These lectures will be of particular interest for students working in fundamental sciences (physics, informatics, mathematics) in connection with life sciences.

## **Objectives & skills**

After having attended this course, the students should have:

- acquired elements of general scientific knowledge
- been introduced to advanced topics in each of the specialized lectures. Such topics may be useful for their doctoral and future research activities
- understood the richness of the connection between molecules and materials within the life sciences.
- understood the complementarity between the “chemistry for biology” and “bioinspired” approaches. These topics will be presented as a guiding thread throughout the course.

The students will be invited to provide online feedback on this course to check whether these objectives have been reached. The lectures will be improved in the following years according to their comments.

## **Organization**

### *Lecturers*

A team of trainers/lecturers has been gathered among highly motivated researchers from the “Chemistry for life sciences” thematic field of the Institute of Chemistry of Clermont-Ferrand (UCA CNRS SIGMA): Sylvie Ducki (Pr. SIGMA), Sophie Faure (CR CNRS), Marielle Lemaire (Pr. UCA), Jean-Marie Nedelec (Pr. SIGMA), Vanessa Prévot (CR CNRS), Valérie Sautou (PH-PU UCA/CHU). While sharing a common scientific culture at the chemistry/life sciences interface, these researchers possess different backgrounds. This team is indeed representative of the diversity of research areas that will be discussed.

### *Programme*

The series of lectures will begin with an introductory session intended to provide the basic

knowledge in chemistry and biology required for the course (1 h). Then, selected topics will be addressed in 2h- or 3h-lectures.

Schedule & Title	Instructor	Keywords
1 <sup>st</sup> day / 1 hour <b>Introduction</b>	Sophie Faure (Researcher, CNRS)	- Chemistry basics - Elements of biology/biochemistry
1 <sup>st</sup> day / 2 hours <b>Drug Design</b>	Sylvie Ducki (Prof., SIGMA)	- Drug discovery and development - From living systems to marketed drugs
1 <sup>st</sup> day / 2 hours <b>Foldamers</b>	Sophie Faure (Researcher, CNRS)	- Artificial folded molecular architectures - Biomolecules mimetics
2 <sup>nd</sup> day / 3 hours <b>Biomaterials</b>	Jean-Marie Nedelec (Prof., SIGMA)	- Bioceramics - Composites - Implants / Tissue Engineering
2 <sup>nd</sup> day / 2 hours <b>Medical devices and container-content interactions</b>	Valérie Sautou (Prof., UCA/CHU)	- Medical devices - polymers - plasticizers release – drug interaction
3 <sup>rd</sup> day / 2 hours <b>Enzyme catalyzed cascade reactions</b>	Marielle Lemaire (Prof., UCA)	- Enzyme, biocatalysis, green chemistry - Expression and co-expression of enzymes, immobilization <i>in cellulo</i> and <i>in vitro</i>
3 <sup>rd</sup> day / 2 hours <b>Bionanocomposites</b>	Vanessa Prévot (Researcher, CNRS)	- Immobilization of biomolecules and active ingredients on support - fields of application