

Molecular Engineering of Pi-conjugated Systems



SCHOOL
Faculty of Science



CAMPUS
Belle-Beille



LEVEL
2nd year Master's degree



OPEN TO EXCHANGE STUDENTS
Yes



SEMESTER
Fall (S1)

> **Degree course:** Light, Molecules, Matter

> **Teaching unit:** UE3

> **Course language:** English

> **Duration (hours):** 40

> **ECTS:** 3

> **Teacher(s):** David CANEVET

> **Assessment:**

Continuous assessment

Final exam

> **Teaching methods:**

Lecture course 24 hours

Tutorial course hours

Practical work 16 hours

Case study

Project

COURSE DESCRIPTION

- Classic organometallic coupling reactions (Pd, Ni or Cu catalysts): Stille, Heck, Kumada, Sonogashira, Suzuki, Negishi. Direct arylations (directed or not), applications to aromatic heterocycles.
- Click chemistry (Cu, Ru) and C-H activation.
- Metathesis reactions, principles, (diastereo)selectivities.
- Amination and sulfuration reactions to design new syntheses of pi-conjugated systems.
- Interest of non-noble metals in synthesis.
- Main electro- and photoactive organic derivatives.
- Nanocarbons: fullerenes, nanotubes and graphene.
- Perylene, naphthalene, porphyrin, phthalocyanin, tetrathiafulvalene.
- Pigments (diketopyrrolopyrrole, isoindigo, Bodipy etc ?).
- Thiophene, furane, pyrrole, dithieno- pyrrole, fluorene, carbazole, phenylenevinylene, phenyleneethynylene ?
- Organometallic complexes displaying optoelectronic properties.
- Design, synthesis, reactivity and functionalisation of these monomers.
- Design and synthesis of Q8pi-conjugated systems (oligomers and polymers displaying a weak band gap).
- Analysis of structure/properties relationships and importance of these derivatives.
- Green chemistry applied to pi-conjugated molecules (12 principles of green chemistry, atom economy, calculations of E factor).

OBJECTIVES

This teaching unit is dedicated to the main families of pi-conjugated systems used in organic electronics and photonics. The synthesis and functionalization of photo and electroactive organic architectures will be discussed. Particular attention will be paid to the impact of functionalization on physico-chemical properties. In a pluridisciplinary manner, this unit will also raise awareness of the basic concepts of green chemistry and the interest of non-noble metals in synthesis.