Ingénierie moléculaire des systèmes pi-conjugués

Niveau d'étude
BAC +5 / master

ECTS
3 crédits

Composante
Faculté des sciences

En bref

- Langue(s) d'enseignement: Français
- Ouvert aux étudiants en échange: Oui

Présentation

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) selectivies.
— Amination and sulfuration reactions to design new syntheses of pi-conjugated systems.
— İnterest 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, dithienopyrrole, fluorene, carbazole, phenylenevinylene, phenyleneethynylene ...
- Organometallic complexes displaying optoelectronic properties.
— Design, synthesis, reactivity and functionalisation of these monomers.
— Design and synthesis of extended pi-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).

Objectifs

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. A particular attention will be paid to the impact of functionalization over physico-chemical properties. İn a pluridisciplinar manner, this unit will also raise awareness to the basic concepts of green chemistry and the interest of non-noble metals in synthesis.

Heures d'enseignement

CM	Cours magistral	24h
TD	Travaux dirigés	16h

Compétences visées

Understand the reactivity of organometallic catalysts an their interest in molecular and macromolecular synthesis (C-C, C-heteroatom bond formation, direct arylations, metathesis).
Handle the main synthetic methods to prepare pi-conjugated systems (heterocy-clic chemistry, organometallic coupling reactions, polymerization strategies, cycload-ditions).
Design the retrosynthesis of a given pi-conjugated system by taking into account the concepts of green chemistry.
Understand the main principles of molecular engineering (polarity vs polarizability, extension and functionalisation of conjugated systems, dyes, pigments,...).
Comprehend the methods developed to fine-tune the levels of frontier orbitals and the band gap of molecular materials for organic electronics and photonics.
Use spectroscopic or electrochemical measurements to study a conjugated system and evaluate its potential in organic electronics.
- Know the main classes of molecular and macromolecular systems reported in the literature and their respective synthesis
- Differente nanocarbons and proposing well-suited functionalization strategies

İnfos pratiques

Lieu(x)

› Angers

Campus

› Campus Belle-beille