

University of Rennes 1 - Institut des Sciences Chimiques de Rennes UMR 6226 CNRS

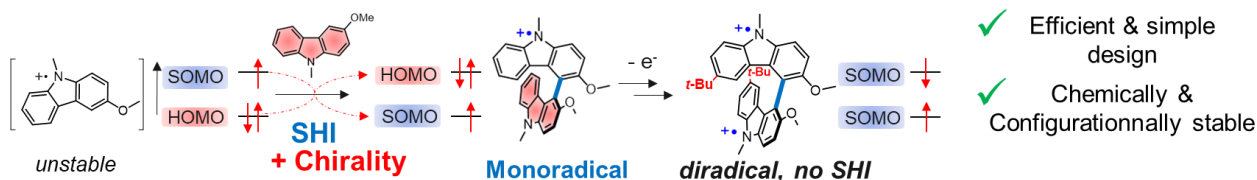
Innovative Chiral Organic Radicals for Applications in Optoelectronics

PhD position 2023-2026

The main objective of this PhD project is to design stable chiral π -conjugated radicals for innovative (spin-)optoelectronic applications. This PhD position is open at the "Institut des Sciences Chimiques de Rennes" (ISCR – UMR 6226 CNRS) within the Organometallics: Materials and Catalysis team and under the supervision of Dr. Ludovic Favereau.

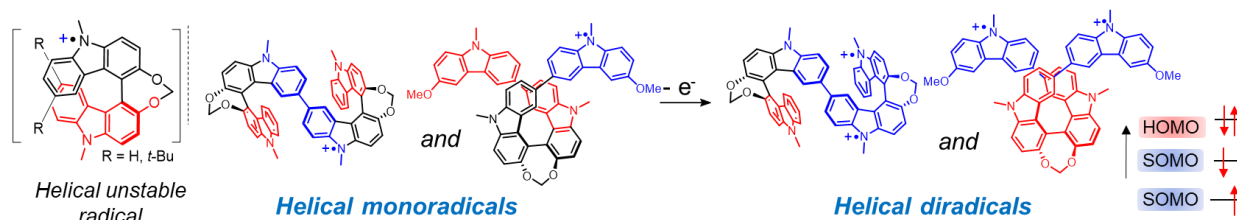
Chiral π -conjugated materials have recently emerged as a promising direction in material science due to their specific interaction with circularly polarized light and the potential of the latter in organic light-emitting diodes (OLEDs), organic field-effect transistors (OFETs) and spintronics (Fuchter *and co.*, *Nat. Rev. Chem.* **2017**, 1 (6), 0045). While extensive researches have been focusing on organic closed-shell chiral dyes, a few attention has been given to their open-shell counterparts due to their low configurational stability and high chemical reactivity. We recently contributed to this research area by obtaining the first enantiopure chiral monoradicals displaying SOMO-HOMO inversion (SHI, Figure below, top). These results allowed us to further design and isolate extended helical mono- and diradicals (Figure below, bottom), affording new perspectives for the synthesis of innovative (chiral) open-shell systems, and their implementation in organic field-effect transistors (OFETs), organic light-emitting diodes (OLEDs), and spintronic devices.

➤ **SOMO-HOMO Inversion (SHI) impact on classically unstable radical**



J. Am. Chem. Soc. **2020**, 142, 20409

➤ **Persistent Helical mono- and diradicals with SOMO-HOMO inversion in the diradical state**



J. Am. Chem. Soc. **2022**, 144, 7253

In this PhD project, we intend to **take the SHI concept a step further, introducing novel classes of persistent chiral organic open-shell systems, exhibiting SHI and potentially high-spin (triplet) ground state**, along with their in-depth experimental and theoretical optical, chiroptical and spin properties. This multidisciplinary research project is part of an European Research Council project (Grant Agreement number: 101041516—SHIFUMI—ERC starting grant (StG), <https://www.bretagne-pays-de-la-loire.cnrs.fr/fr/personne/ludovic-favereau>) and will be an excellent

opportunity for the PhD candidate to acquire scientific and soft skills valuable for academic and professional careers.

The main part of the project will be devoted to the synthesis of chiral organic molecules with different electronic/spin properties and the study of their photophysical, chiroptical and magnetic properties (UV-vis absorption, circular dichroism, circularly polarized luminescence, electron paramagnetic resonance, all being available in the institute) both in solution and solid state.

We are looking for a highly motivated Ph.D. candidate with a strong background in organic/organometallic chemistry. Experience/interest in photophysical properties will be an added value. In addition, a strong motivation for research and good communication skills are required (fluent English or French speaking is mandatory).

Salary (net) ~ 1700 €/month, starting date: October 2023

Please send your records (CV + marks + recommendation letters) to:

- **Dr. Ludovic Favereau**, ludovic.favereau@univ-rennes1.fr, tel : 02 23 23 68 91