PhD in Molecular Chemistry:
donor-accePtor nanorIngs for red PhosPhorescent organIc light emittiNg diodes (PIPPIN)

The host group, localized at the Institut des Sciences Chimiques de Rennes at the Université de Rennes 1, possesses recognized experience in both fields of organic materials for organic electronics[1,2] and nanorings.[3,4]

The objective of the present PhD is to synthesize new generations of organic semi-conductors (OSC) for Organic Electronics. The last ten years have revealed the full potential of the new generation of electronic components using organic materials, so called *Organic Electronics* or *Plastic Electronics*. This electronics displays many advantages such as the possibility to be deposited on foldable/flexible substrate (Fig. 1). In the last years, the first foldable/flexible/rollable electronic devices have become commercially available, providing new directions for the future of electronic display. The heart of an electronic device is the OSC. For more than 20 years designing OSCs has been an intense research field worldwide, which have allowed the fantastic development of Organic Electronic technologies. However, fundamental researches are still strongly needed and particularly to develop new generations of OSCs possessing notably 3D charge transport. Thus, **the present PhD position will deal with the synthesis and the characterization of new generations of organic materials only discovered 14 years ago: Molecular Nanorings.** Indeed, since their discovery in 2008,[5] hoop-shaped π-conjugated macrocycles possessing radially directed π-orbitals (so called '*nanorings*') have been the subjects of intense researches.[6-8]. Compared to their linear counterparts, nanorings possess unique electronic and structural characteristics (Fig. 2).[7,8]

Figure 1 : Example of flexible/rollable organic electronic devices

Figure 2. Fluorescence properties of linear and cyclic oligophenylenes

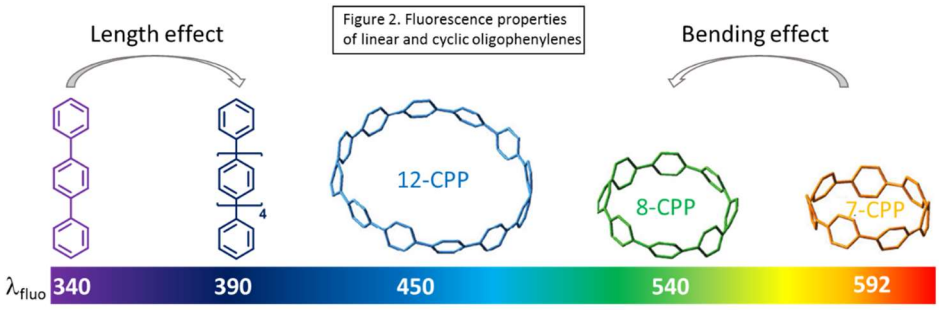
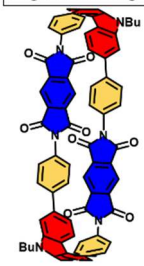


Figure 3. Example of targeted nanoring



In 2021, the research on nanorings has gone one step further as charge carrier properties have been characterized for the first time.[3] However, the charge transport properties of nanorings are almost unknown in the literature and everything remains to be explored. This project displays hence a pioneer character, nevertheless some works related to nanorings have already been achieved in our team.[3,4,9,10] The scientific methodology will be divided in three main tasks: **Synthesis of the nanorings (Fig. 3), determination of their physical/electronic properties (electrochemistry, absorption/emission spectroscopy, molecular modelling) and incorporation in electronic devices.** This last part will be done in collaboration.

The present work is highly multidisciplinary with a strong emphasis on organic chemistry. The candidate should hence have excellent skills in molecular synthesis. Determination of electronic properties (UV-vis spectroscopy, electrochemistry, molecular modelling) could be acquired by internal lab training. A strong motivation for academic research is mandatory. The candidates are invited to contact C. Poriel (DR CNRS) / C. Quinton (CR CNRS) to discuss about this project.

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