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PhD position (Fall 2018)

Electron transfer molecule-based materials: towards multifunctional ferroelectric materials

Institut des Sciences Chimiques de Rennes, University of Rennes, France

Ferroelectric materials exhibit macroscopic spontaneous polarization owing to the collective arrangement of dipole moments in long distance, and the direction of the polarization can be switched by an external electric field. This electroactive system finds a wide range of technological applications notably in nonvolatile memories, medical ultrasound machines, high-quality infrared cameras, or even in sonar. The field of ferroelectric materials has been largely dominated by inorganic solid materials, particularly transition metal oxides. Very recently, molecule-based materials have been proposed as desirable next generation ferroelectric materials, owing to the synthetic versatility that allows us to optimize properties, to incorporate multifunctionalities, and to adapt environmentally friendly processing. Here, the important synthetic consideration to induce ferroelectricity is to organize molecular units into an ordered lattice, which will then exhibit correlated motion under the influence of electric field.

This project aims to develop new family of molecule-based materials featuring electron transfer. The judicious design of materials, in which molecular building blocks are organized by charge transfer interactions and coordination chemistry, will likely induce not only electric properties but also magnetic phase and light-switchability. The initial effort of the project will focus on synthesis of organic and inorganic molecular building blocks and then their assembly reactions. The assembly reaction will be performed by diverse techniques, including classical solution-based diffusion, solvothermal, sublimation, or electrochemical method, in order to grow high-quality single-crystal materials. The final materials will be characterized by various means of characterization techniques, such as single-crystal X-ray diffraction, optical spectroscopies, electric and magnetic measurements. The project will be co-supervised by Dr. Marc Fourmigué and Dr. Ie-Rang Jeon at the Institut des Sciences Chimiques de Rennes in France.

Qualifications:

We are looking for a student with good knowledge and experience on **organic synthesis** and **coordination chemistry**. The successful candidate will have high motivation and interest in pursuing multidisciplinary research (synthetic chemistry, crystallography, solid-state physics, etc.).

Other information:

The student should obtain their PhD degree within 3 years of the financial support (Fall 2018 - Fall 2021). The PhD scholarship includes a full social security coverage and a net salary of ~1400 Euros. The university of Rennes offers French courses for foreign students and hosts an international Erasmus Mundus program.

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