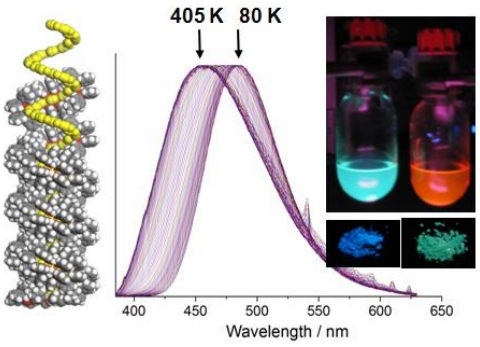
Supramolecular Cu(I) assemblies for multifunctionnal luminescent molecular materials



In the perspective of the development of new highly emissive molecular materials, very promising solid state highly emissive Cu(I) metal complexes have been recently described (copper being the 25th more abundant element in the earth's crust). Nevertheless, the structural variety of these metal complexes is to date rather limited and associated to case-per-case elaborated multi-step ligand syntheses, giving access to a limited number of structurally different complexes which hinders the diversity of photophysical properties. The goal of this PhD work will be to overcome these synthetic limitations using a very general and versatile coordination-driven supramolecular approach that have been previously developed by the PhD supervisor.(1,2) From a selected set of cheap and commercially available starting materials, a large number of polymetallic structures bearing easily modulated original molecular architectures and solid state emissive properties are expected to be obtained accordingly to a recently achieved study.(3) The new derivatives obtained will be characterized using different techniques such as solution multinuclear NMR, single crystals and powder X-ray diffraction analyses, UV-Vis and IR spectroscopies, In addition, the photophysical properties (emission spectrum, quantum yields, life time) of the emissive materials obtained will be studied on solution and in the solid state at room temperature and at low temperature. This will allow targeting a field of application for one given compound, including wide range lighting applications and/or multifunctional molecular materials such as thermochromic, mecanochromic or vapochromic systems.

This PhD work will be conducted in the INSA Group of the Solid State Chemistry and Materials team at the Rennes Institute of Chemical Sciences (ISCR). To allow prompt progress in this PhD project, all synthesis laboratory classical materials (including air-sensitive chemistry) and state of art photophysical characterization devices (solid and liquid temperature variable UV-Vis and near IR spectrofluorometers, Quantum yields measurements,...) are fully available in the INSA of Rennes. In addition, other characterization tools (X-ray powder diffractometers, TGA, MEB...) are readily accessible in the INSA together with all the facilities available at ISCR (large park of NMR devices and X-ray diffractometers,...). In addition, this project will also take benefit of the network of international collaboration already established by the research team, including collaborative works involving groups in China, Hong Kong and Germany.

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