CHEMISTRY MASTER - M2

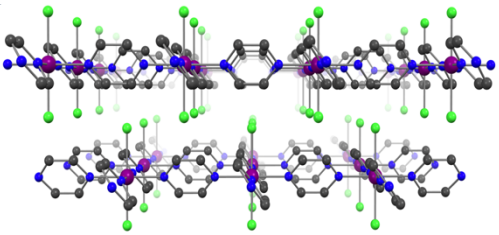
INTERNSHIP **2020-2021** (end of January – end of June)

Options of Master (please tick the box(es) of the training that fits the field of the internship) :

MA (Advanced Materials) ■ - **COSV (Organic Chemistry and Life Sciences)** ■

MMF (Functional Molecules and Macromolecules) ■

PCCP (Physical Chemistry and Chemical Physics) ■

TITLE	**Synthesis and characterization of conductive coordination polymers**
SUBJECT	Metal Organic Frameworks (MOFs) are highly ordered materials consisting of metal ions or complexes coordinated to organic ligands. Even though these coordination polymers are promising materials for gas capture and storage, as well as for drug delivery and catalysis, their often-low electronic conductivity has hindered their use in diverse applications (*e.g.* electrocatalysts, sensors, field-effect transistors, supercapacitors, etc.). Only recently, highly conductive two-dimensional (2D) MOFs based on square planar coordinated metal ion nodes have been reported. However, highly conductive MOFs based on the much more common octahedrally coordinating metal ions nodes are exceedingly rare. Keeping this in mind, the M_3 team at the CRPP has prepared a novel coordination solid: $TiCl_2(pyz)_2$ (pyz = pyrazine, see Figure). This material, synthesized from Ti(II) and pyz ligand, features octahedrally coordinated Ti ions and displays a room temperature electrical conductivity value (σ_{RT} = 0.48 S cm^{-1}) that is only surpassed by a handful of square-planar Cu(II) and Ni(II) coordination solids. The strong reducing nature of the Ti(II) metal ion results in an electron transfer to a pyrazine ligand, yielding a partially reduced ligand scaffold that proffers the electronic conductivity. Following this work, the master internship will be devoted to the design and synthesis of 2D systems with interesting conductive properties.  ***Figure*** Perspective view of the 2D structure of $TiCl_2(pyz)_2$. Colour code: purple, Ti; light green, Cl; blue, N; dark grey, C. H atoms have been omitted for clarity.
TECHNIQUES USED	Synthesis: Organic & coordination chemistry; crystallization if necessary. Characterizations: IR, UV, NMR spectroscopies; cyclic voltammetry, X-ray diffraction (single-crystal & powder); magnetic susceptibility, conductivity, calorimetric measurements… This internship will take place inside a multi-nationality team. Therefore, good knowledge in **English** will facilitate the communication with the other group members.
HOST LABORATORY	Centre de Recherche Paul Pascal – UMR 5031
TEAM	Molecular Materials & Magnetism (M_3 - CRPP)
SCIENTIFIC DIRECTOR	Name: Rodolphe Clérac Tel: 06 03 51 74 16 eMail: clerac@crpp-bordeaux.cnrs.fr Address: 115 avenue Dr. Albert Schweitzer, 33600 Pessac – France

Possibility to pursue the internship until the end of JULY: YES ■ / NO □

Possibility to offer the internship to a M1 if not attributed to a M2: YES ■ / NO □