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	**Molecule-based high-T_C magnets**
SUBJECT	The quest for high performance magnetic materials is essential to respond to the market demand in information storage as well as in many other domains. Despite their extensive technological use, the current magnets experience several drawbacks, such as **high energy consuming fabrication** and **limited access to key elements**. This has led to a sustained effort towards identifying **new molecule-based magnetic materials** that possess all the features associated with the traditional magnets but benefit from the advantages of molecular chemistry. For instance, molecule-based magnets can be synthesized in mild conditions and their solubility in organic solvents allows for the tuning and post-synthetic modification of their physical properties. The M_3 group at the CRPP has recently demonstrated that the post-modification of a 2D coordination "polymer" Cr(pyrazine)$_2$Cl$_2$ (***Nat. Chem.*** **(2018)**, 10, 1056) with reducing agents has led to a new material with very exciting properties. The initial compound shows a ferrimagnetic order at 55 K, whereas the post-modified material is a magnet below 510 K, well above the room temperature (***Science***, accepted). The huge increase of the ordering temperature is explained by the generation of radicals on bridging ligands in the 2D network. As a continuation of the work done in the Cr(pyrazine)$_2$Cl$_2$ system, this master project will be devoted to the design and synthesis of new high-T_C magnets using other known 2D systems M(pyrazine)$_2$X$_2$, M being a 3d metal ion and X = I, Br anions or O-based ligands.
TECHNIQUES USED	Synthesis: Molecular chemistry (organic and coordination chemistry); crystallizations. Characterizations: IR, UV, NMR spectroscopies; cyclic voltammetry, X-ray diffraction (single-crystal & powder); calorimetry… Advanced Properties: optical and magnetic 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 & Corine Mathonière Tel: 06 06 03 51 74 16 email: clerac@crpp-bordeaux.cnrs.fr Tel: 06 37 06 93 41 email: corine.mathoniere@u-bordeaux.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 □