


Internship proposal 2009-2010

Laboratory : Institut de Minéralogie et Physique de la Matière Condensée	
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Research of new transition metal sulphides with unusual physical properties

Scientific project :

For technological development and to meet new demands of the tomorrows society there is a constant need for new materials with new or improved properties. The perovskite structure has and continues to attract interest, because properties suitable for applications can be found for compounds with this structure. The study of oxides-based perovskite AMO_3 (A is a divalent or trivalent cation, M is a transition metal) and derived compounds has shown original physical properties such as high temperature superconductivity in cuprates and colossal magnetoresistance in manganites. We know that controlling the electronic state of the transition metal through aliovalent substitutions of the A cation has been the key for the discovery of these properties.

Unlike AMO_3 oxides, the sulphide system, AMS_3 has been less studied but should show similar properties and perhaps new physical phenomena because of the amphoteric characteristic of sulphur in comparison to oxygen. In the *Institut de Minéralogie et de Physique des Milieux Condensés (IMPMC)* you will study the $A_{1-x}La_xMS_3$ system in which $A = Sr$ or Ba and $M = Zr$ or Hf . La^{3+} cation acts as a dopant for M.

Techniques in use :

To stabilise the system, high-pressure synthesis up to few GPa will be performed on “Paris-Edinburgh” presses, IMPMC being one of the leader laboratory in this domain. Structural properties will be determined by x-ray diffraction techniques. Physical properties as a function of x will be explored by different techniques: magnetoresistance, Hall effect, magnetisation and optical conductivity under normal or extreme conditions of temperature and pressure.

Applicant skills :

We are looking for students that like experimentation in a domain at the border of solid state physics and material chemistry.

Granted internship : yes (400€/month)
C'nano IdF laboratory (France only): yes
Possibility for a thesis : yes (type of grant : Doctorate school)