**Study of ZnSb2O6-based compounds as thermoelectric materials**

***Context, description and skills acquired during this work***

Research attention is focussed on novel thermoelectric materials due to: (i) increasing in energy requirement and (ii) pollutions linked to human activities. Thermoelectric effect is the direct conversion between heat and electric energies. Several industries, ex. car makers, have investigated in the integrating of thermoelectric devices to recover the waste heat energy. However, the yield is still limited within available materials. A good thermoelectric material should present a high electric conductivity, a low thermal conductivity and a high thermopower (Seebeck) value. The best available materials content toxic or expensive elements and are not stable under air at mid- and high temperature range. To overcome those problems, researches of new materials (such as oxides, due to their chemical stable, friendly environment and possibility of working at medium and high temperature) are of great interest.

This 3 months stage will be held at the Orsay Institute of Molecular Chemistry and Materials, University Paris Sud, in France. The main objective of this work is to study doped ZnSb2O6 compounds with enhanced thermoelectric properties. In fact, preliminary results obtained with former USTB exchange student, XiaoXiao CHANG, seem to propose unexpected doping possibilities into Sb crystallographic sites, leading to new horizon of research related to those compounds. It is important to highlight why the doping elements prefer to go into Sb-sites, but not Zn-sites. Furthermore, we could like to study the effect of nanostructuration on the thermoelectric properties of those compounds.

Several others techniques could be involved during this training, in particular, nanopowder synthesis (precipitation), powder characterizations (XRD, SEM), SPS and physical measurements (Seebeck, electrical resistivity and thermal conductivity, specific heat…). Thermoelectric characterizations are carried out in our laboratory, where we dispose of several systems for measuring in equilibrium and out-of-equilibrium conditions (from few K till over 1000 K, and in various atmospheres such as vacuum, oxygen, argon or gas mixture…).

No grant from Universite Paris-Sud has been provided for the internship. The student will be integrated in a PhD project.

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