Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : CHAPUIS Given names : P-Olivier

Status (prof., assistant prof., …) : CNRS researcher

Laboratory :	Centre for Energy and Thermal Sciences of Lyon (CETHIL)	Website address : http://cethil.insa-lyon.fr
Institution :	National Institute for Applied Sciences (INSA), Lyon	Website address : http://www.insa-lyon.fr/en

Scientific competence of the supervisor:

The 'Micro and Nanoscale Heat Transfer' (MiNT) group at CETHIL consists usually of 15 members, including 5 permanent researchers. P-Olivier Chapuis' scientific interests deal with modelling and metrology related to nanoscale energy transport. Nanoscale thermal management inside materials and sub-wavelength thermal radiation, nanothermodynamics and the applications in energy-harvesting devices, are the main research topics.

Two major publications in the field proposed for the PhD :

1. Non-idealities in the 3omega method for thermal characterization in the low- and high-frequency regimes, W, Jaber and P.-O. Chapuis, AIP Advances 8, 045111 (2018)
2. Native oxide limited cross-plane thermal transport in suspended silicon membranes revealed by scanning thermal microscopy, A.M. Massoud, et al., Applied Physics Letters 111, 063106 (2017)

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Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-1,IV-2,IV-6,V-4,

Title : Heat conduction at nano-interfaces and implications on thermomechanical interface properties

Subject :

The control of heat transfer is key to many applications of the 21st century, especially if one wants to reduce the global energy consumption or at least limits its increase. In addition, heating is detrimental to nanoelectronics as device performances decrease when temperature increases. Unfortunately, Fourier's law of heat conduction is not anymore valid at nanoscale, due to the presence of interfaces and also to the change in the nature of heat conduction: it ceases to be diffusive, and becomes ballistic. This leads unfortunately to local overheating and to hot spots in nanoelectronics. In the current PhD project, the impact of the ballistic regime and the associated temperature jumps at boundaries on the thermomechanical properties at interfaces will be studied, by means of electro-thermal experiments and by means of simulations solving the Boltzmann Transport Equation for the involved energy carriers, the phonons. This works builds on previous significant results and will lead to multiscale tools aiming at solving thermomechanical issues.

Keywords :

Heat transfer, Nanostructure, Phonons, Wave

Expected collaborations :

Research groups working in the nanophononics and phonon enrgineering areas and the INL NanoLyon platform on the campus. Usual work is performed in close collaborations with various groups around the world.

Background required from the applicant :

Heat conduction, Thermomechanics, Solid-state physics, Acoustics

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

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