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Modeling thermal transport across superlattices and at solid/liquid interfaces: how to tune interacial heat flow ?

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Date: Wednesday, 25 July. 2018, 10:00-11:00

Venue: Faculty of Engineering Bldg. 2, 3F, 31B

Abstract:

In this contribution, I shall illustrate how molecular dynamics may provide insights in the microscopic origin of thermal boundary resistance.

The first part of the talk will be devoted to superlattices, ie regular arrangements of solid thin layers. We will characterize how nanoscale roughness, local amorphization or electron-phonon couplings may affect the Kapitza resistance at the interfaces of the superlattice. We should underline opportunities to build modified analytical acoustic models to capture these effects. The necessity to consider local force constants derived from ab initio calculations will be also discussed.

The second part will concern thermal transport at the interface between solid and soft materials. We will outline different strategies to tune interfacial heat flow. In the quest of high thermal conductance, we shall illustrate how pressure may facilitate interfacial heat transfer. The physical origin of this effect is to be found in the broadening of the liquid density of states, thus creating additional energy channels at the interface. Conversely, we shall show how the presence of nanoparticles in the liquid may decrease the interfacial conductance and severely delay ultrafast boiling.

Biology:

Samy Merabia obtained his phD from the University of Orsay in 2004 in the field of polymer physics.
He did a first postdoc at the University of Barcelona, working on wetting and interfacial phenomena.
In 2008, he moved to Lyon, France first as a postdoc and started working on nanoscale heat transfer around plasmonic colloidal nanoparticles. He was hired in 2009 as a CNRS research scientist at the Institute Light and Matter, where he is leading a modeling activity around nanoscale thermal transport with emphasis on soft materials. In 2016, he was invited researcher in the group of prof. Müller-Plathe in Darmstadt, Germany.
Samy Merabia published more than fifty papers in international peer reviewed journals (PNAS,PRL,JPCL,Nanoscale,APL).
He supervised 5 phD students and cosupervised 4 postdocs.

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