21COE プログラム「機械システム・イノベーション」公開セミナー

21COE プログラム「機械システム・イノベーション」平成 19 年度第 X 回公開セミナーを開催いたします．Pawel Keblinski 先生は，原子スケールシミュレーションと理論的なアプローチを駆使し，固体材料の熱伝導，ナノ複合材料の機械的あるいは熱的な問題などの研究で世界的な成果を挙げています．今回，来日の際に東大でのセミナーをいただけることとなりました．ふるってご参加いただきますようどうぞ宜しくお願い申し上げます．

記

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題目：**Are interfaces good or bad for thermal management?**
-- Mediocre carbon nanotube composites and ultra-low thermal conductivity solids --

日時：2007 年 12 月 11 日（火）13:30~15:00

場所：東京大学工学部 2 号館 3 階機械系会議室(2-31A 号室）
地図：http://www.u-tokyo.ac.jp/campusmap/cam01_04_03_j.html

概要：
When the microstructural feature, such as grain size in nanocrystalline materials or fiber diameter in nanocomposites, becomes comparable with the mean free path of the phonon (heat carrying thermal wave) the thermal transport is determined by thermal properties of interfaces rather than by bulk thermal conductivities.

In the case of carbon nanotube (CNT) polymer composites and suspensions interfaces play a detrimental role and severely limit the effective conductivity of the material due to large interfacial thermal resistance. Using a combination of modeling techniques including atomistic simulations, finite element analysis and homogenization theories, we will (i) demonstrate the physical origin a large interfacial thermal resistance between CNTs and soft media, (ii) explain why the thermal transport in CNT composites does not shows a signature of percolation and (iii) suggest possible solutions that maximize thermal conductivity of CNT composites.

In the quest for better thermally insulating materials interfaces can greatly help and allow to beat low thermal conductivity limits of amorphous or alloy materials. Using molecular dynamics simulations and phonon analysis we will show that the introduction of grain boundaries into layered crystals can explain recent experimental results on ultra low thermal conductivity (0.05 W/m-K) of WSe_2 crystals. Furthermore, we predict that introduction of mass disorder lead to a complete localization of phonons and further lowers thermal conductivity to about 0.01 W/m-K at room temperature, which is well below values characterizing still air.

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