ELECTRON AND PHONON TEMPERATURES: APPLICATION TO THE THERMAL-SHOCK PROPAGATION IN NANO-SYSTEMS

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ABSTRACT

The rapid progress in nano-technology and its very huge impact in modern life have stimulated a true revolution in the heat-transfer phenomenon, spreading its domain of applicability and discovering new regimes and phenomenologies wherein the Fourier law and some classical theories are no longer applicable, if one aims at the correct modeling and interpretation of the experimental data.

A better understanding of the physical mechanisms governing the heat transfer at nano-scale may lead to a more accurate thermal management of optoelectronic devices, as well as to a better design of advanced materials (characterized by novel thermal-transport features) which could enhance the ability of the energy conversion.

In order to correctly describe the heat transport at nano-scale one should properly split the non-equilibrium temperature T into two different contributions: the electron temperature T^e and the phonon temperature T^p.

For this reason in literature some very interesting models of heat transfer involving those two different temperatures can be found.

As a possible alternative to those models, in this talk we propose a theoretical two-temperature model which fully agrees with the well-known Maxwell-Cattaneo theory for the description of the heat transport in a rigid body [1].

The aforementioned theoretical model is then used to study the propagation of thermal shock in nano-systems [2].

REFERENCES

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