東京大学グローバルCOEプログラム　機械システム・イノベーション国際拠点

東京大学 THE UNIVERSITY OF TOKYO

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## Thermal Characterization of a Radiating-Conducting System With and Without Non-Fourier Effects


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## 要旨


Nothing is devoid of temperature, and no process is instantaneous. Heat is an entity, and depending on the conditions to which the medium is subjected, it takes some finite time to propagate from one location to the other. Thus, the establishment of any kind of thermal field in a medium, by any mode of heat transfer (conduction, convection and radiation) or the combined effect of the two or all three, as an instantaneous process, depends on the temporal and the spatial dimensions (scales) that one deals with. For example, radiation, an electromagnetic wave, travels with the speed of light In most of the transient conduction and/or convection processes involving radiation, radiative transport is instantaneous, but it is not so, when one deals with the time scale as low as a nano-second Similarly, in the classical Fourier's law of heat conduction, the assumption that the effects of the thermal perturbation is felt instantaneously does not hold true in many situations. A finite propagation speed of conduction wave, which is not there in Fourier's law, needs to be accounted. This consideration, in one hand, gives correct results, but brings additional difficulties. Mathematically, from parabolic, the governing energy equation turns to be a hyperbolic one. This talk will discuss transient and instantaneous aspects with regard to propagation of heat by conduction with and without volumetric radiation. The increase in difficulty levels with Fourier to non-Fourier aspects will be addressed for different geometries. Dependence of the distinct thermal wave front on various parameters, and what they mean, will be addressed. In real life, when and where, this work finds applications will be elaborated, and how best this can be a deterministic thermal tool in characterizing a thermal system will be discussed.



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