

A Microstructural Approach to the Ballistic-diffusive Heat Transfer

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Heat transport in nanostructures is highly nonequilibrium and dominated by the interfacial processes. The ballistic-diffusive heat model is presented as tool to deal with transient heat conduction problems in low-dimensional structures such as thin films and superlattices. Heat carriers viewed as a collection of randomly moving and interacting particles and quasiparticles are described by space-time distributions within a combined thermodynamic and microstructural diffusive-kinetic approach. Knowledge of these distributions permit the evaluation of the heat flux and the internal energy. The local temperature considered as a measure of the local internal energy is composed from the ballistic and diffusive parts. The hyperbolic ballistic-diffusive heat conduction equation is then derived and a comparison with other models and its numerical verification are presented.

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