Diffusive-Ballistic Heat Conduction along a Single-Walled Carbon Nanotube

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The diffusive-ballistic heat conduction of finite-length single-walled carbon nanotubes has been studied by means of nonequilibrium molecular dynamics simulations. The length dependence of thermal conductivity [1] is quantified for a range of nanotube lengths up to 1.6 μm at room temperature. A gradual transition from nearly pure ballistic to diffusive-ballistic heat conduction was identified from the thermal conductivity profile. In the diffusive-ballistic regime, the profile exhibits power-law length dependence and does not converge even for a tube length of 1.6 μm [2]. The diffusive-ballistic phonon transport regime covers a wide range of nanotube-lengths in actual applications due to the extraordinary long phonon mean free path at room temperature. This gives rise to various unique stationary and non-stationary heat conduction characteristics [3,4]. Furthermore, several issues of heat transfer in practical situations are studied by MD simulations [5].

References

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