

Sugiyama, Masaru; Goto, Kuniaki; Takada, Kazunori; Valenti, Giovanna; Currò, Carmela
Statistical-thermodynamic study of nonequilibrium phenomena in three-dimensional anharmonic crystal lattices. III: Linear waves. (English) [Zbl 1072.82529](#)
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Summary: As typical nonequilibrium phenomena, linear waves propagating in isotropic solids at finite temperatures are studied on the basis of both microscopic and macroscopic systems of basic equations, which were proposed in the previous papers of the present series. The temperature dependences of the propagation speeds of the longitudinal and transverse harmonic waves are derived explicitly for several metals. Their amplitude ratios are also obtained as the functions of the temperature. Singularities of the physical quantities at the melting point are found out and discussed. The validity of the so-called local equilibrium assumption, which has usually been taken for granted in nonequilibrium thermodynamics, is reexamined by comparing the macroscopic results with the microscopic ones in detail. And a possibility of going beyond the local equilibrium assumption in the analyses is discussed in connection with extended thermodynamics.

MSC:

[82B30](#) Statistical thermodynamics

Cited in **2** Documents

Keywords:

linear wave propagation phenomena; 3-dimensional anharmonic crystal lattice; continuum theory; local equilibrium assumption; extended thermodynamics

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