

Abstract Submitted
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Three-Phonon Phase Space as an Indicator of the Lattice Thermal Conductivity in Semiconductors¹ L. LINDSAY, D. A. BROIDO, Boston College — The room temperature lattice thermal conductivity of many semiconductors is limited primarily by three-phonon scattering processes arising from the anharmonicity of the interatomic potential. We employ an adiabatic bond charge model [1,2] for the phonon dispersions to calculate the phase space for three-phonon scattering events of several group IV and III-V semiconductors. We find that the amount of phase space available for this scattering in materials varies inversely with their measured thermal conductivities. Anomalous behavior occurs in III-V materials having large mass differences between cation and anion, which we explain in terms of the severely restricted three-phonon phase space arising from the large gap between acoustic and optic phonon branches.

[1] W. Weber, Physical Review B 15, 4789 (1977).

[2] K. C. Rustagi and W. Weber, Solid State Communications 18, 673 (1976).

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