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Title

Thermal conductivity of GeTe/Sb₂Te₃ superlattices measured by coherent phonon spectroscopy

Source

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Abstract

We report on evaluation of lattice thermal conductivity of GeTe/Sb₂Te₃ superlattice (SL) by using femtosecond coherent phonon spectroscopy at various lattice temperatures. The time-resolved transient reflectivity obtained in amorphous and crystalline GeTe/Sb₂Te₃ SL films exhibits the coherent A₁ optical modes at terahertz (THz) frequencies with picoseconds dephasing time. Based on the Debye theory, we calculate the lattice thermal conductivity, including scattering by grain boundary and point defect, umklapp process, and phonon resonant scattering. The results indicate that the thermal conductivity in amorphous SL is less temperature dependent, being attributed to dominant phonon-defect scattering. (25 References).