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Low phonon thermal conductivity of the layered Bi-Te intermetallic alloys PETER SHARMA, ALF MORALES, Sandia National Laboratories, ANA LIMA SHARMA, San Jose State University, MONICA BARNEY, Sandia National Laboratories, FIVOS DRYMIOTIS, JIAN HE, TERRY TRITT, JAMES TURNER, Clemson University — Good thermoelectric materials should have as low a thermal conductivity as possible in order to increase the figure of merit $zT = TS^2/\rho\kappa$. The thermal conductivity of a material is often tuned using microstructure, chemistry, and/or crystal structure. For example, alloy disorder combined with high atomic weights plausibly lead to the low thermal conductivity of commercial Bi_2Te_3-based thermoelectrics. The crystal structure of the Bi-Te intermetallic phases is composed of layers of Bi and Bi_2Te_3 structural units, which can be varied nearly continuously by adjusting the Bi/Te ratio. Compared to both Bi_2Te_3 and elemental Bi, we found that these materials have a strongly reduced thermal conductivity below room temperature. However, this reduction did not depend on the Bi/Te ratio. The Debye-Calloway model was used to explore the origin of the low thermal conductivity in these materials.

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