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Thermal Conductivity of Polycrystalline PbTe with PbSe Nanoparticle Additives[1] IAN M. STEWARD, JEFFREY S. DYCK, John Carroll University, YIXIN ZHAO, CLEMENS BURDA, Case Western Reserve University — Thermoelectric materials (TEMs) are semiconductor materials that use the Seebeck and Peltier effects to convert a temperature difference into an electric potential and vice versa. All thermoelectric materials are characterized by a figure of merit, ZT, which is directly correlated to the thermoelectric energy conversion efficiency. One option to obtain improved ZT values is to lower the thermal conductivity of the TEM. Nanostructuring of traditional TEMs is one avenue toward lowering thermal conductivity, hopefully without significantly diminishing the electrical properties. Pellets of bulk, polycrystalline lead telluride with varying concentrations of PbSe nanoparticle additives were prepared by pressing mixed powders. Measurements of thermal conductivity were performed in the temperature range 6 K – 300 K. The data were compared to a theoretical model in an attempt to link the temperature dependent behavior of the thermal conductivity to the synthesis parameters, nanoparticle concentration, and sample morphology as revealed through Scanning Electron Microscope images.

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