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Influence of Nanostructuring and Heterogeneous Nucleation on the Thermoelectric Figure of Merit in AgSbTe2 PETER SHARMA, Sandia National Laboratories, JOSHUA SUGAR, DOUGLAS MEDLIN — Thermoelectric materials directly interconvert heat and electricity in the solid state. In some cases, nanoscale microstructures improve thermoelectric efficiency, but this phenomenon has rarely been studied systematically for precipitates in bulk materials. We quantified the influence of nanostructuring on the thermoelectric figure of merit (zT) by embedding Sb2Te3 inclusions, from nanometer to micron sizes, in an Sb-rich AgSbTe2 matrix through solid-state precipitation. Nucleation/growth and coarsening regimes of precipitate formation had a clear effect on transport properties, which could be understood using the effective medium theory of a two-phase composite. The majority of precipitates nucleated heterogeneously at grain boundaries and at planar defects found in the matrix phase, forming a complex interconnected network. This heterogeneous nucleation causes the precipitate/matrix system to follow effective medium theory even at small precipitate sizes, thus lowering zT. Therefore, heterogeneous nucleation is a major obstacle to zT improvement using nanoscale precipitates in bulk thermoelectrics.

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