Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Diameter Dependent Thermoelectric Properties of Individual SnTe Nanowires[1] E.Z. XU, Indiana University, Z. LI, Indiana University; Los Alamos National Laboratory, J. MARTINEZ, New Mexico State University, N. SINITSYN, H. HTOON, N. LI, Los Alamos National Laboratory, B. SWARTZENTRUBER, Sandia National Laboratories, J. HOLLINGSWORTH, J. WANG, Los Alamos National Laboratory, S.X. ZHANG, Indiana University — Tin telluride (SnTe), a newly discovered topological crystalline insulator, has recently been suggested to be a promising thermoelectric material. In this work, we report on a systematic study of the thermoelectric properties of individual single-crystalline SnTe nanowires with different diameters. Measurements of thermopower, electrical conductivity and thermal conductivity were carried out on the same nanowires over a temperature range of 25 - 300 K. While the electrical conductivity does not show a strong diameter dependence, we found that the thermopower increases by a factor of two when the nanowire diameter is decreased from 913 nm to 218 nm. The thermal conductivity of the measured NWs is lower than that of the bulk SnTe, which may be attributed to the enhanced phonon - surface boundary scattering and phonon-defect scattering. We further calculated the temperature dependent figure of merit ZT for each individual nanowire. This work was performed, in part, at the Center for Integrated Nanotechnologies, an Office of Science User Facility operated for the U.S. Department of Energy (DOE) Office of Science by Los Alamos National Laboratory (Contract DE-AC52-06NA25396) and Sandia National Laboratories (Contract DE-AC04-94AL85000).

[1]We acknowledge support by the Los Alamos LDRD program.

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Date submitted: 13 Nov 2014 Electronic form version 1.4