Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Thermoelectric properties of GeTe-$CuInTe_2$ alloys SI HUI, Department of Mechanical Engineering, University of Michigan, Ann Arbor, JAMES SALVADOR, Chemical and Materials Systems Laboratory, GM R&D Center, Warren, HUI SUN, Department of Physics, University of Michigan, Ann Arbor, KEVIN PIPE, Department of Mechanical Engineering, Department of Electrical Engineering, University of Michigan, Ann Arbor, CTIRAD UHER, Department of Physics, University of Michigan, Ann Arbor — GeTe-$AgSbTe_2$ and PbTe-$AgSbTe_2$ alloys, known as TAGS and LAST respectively, are excellent thermoelectric materials. By alloying the matrix with other ternary compounds, the thermal conductivity is significantly reduced due to the enhancement of phonon scattering by the formation of nano-sized secondary phases and disturbance to the lattice. Meanwhile, since the ternary compound $AgSbTe_2$ also exhibits good thermoelectric properties and Ag^+ and Sb^{3+} tend to replace two Ge atoms at the same time, the mobility, and thus the power factor, will not be influenced much by this alloying. In this work, we replaced the ternary compound $AgSbTe_2$ by $CuInTe_2$ which does not contain the expensive element Ag and also exhibits good thermoelectric properties. We measured the Seebeck coefficient, electrical conductivity, thermal conductivity and Hall coefficient, and observed that $CuInTe_2$ almost has no influence on the power factor but does reduce the thermal conductivity. ZT was observed to improve to 1.2 at 800K for $(Ge_2Te_2)_{0.97}(CuInTe_2)_{0.03}$. We believe that ZT will be further enhanced at larger $CuInTe_2$ fractions due to further reduced thermal conductivity.

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Date submitted: 14 Nov 2014 Electronic form version 1.4