Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Effects of Ge replacement in GeTe by Ag or Sb on the Seebeck coefficient and carrier concentration modified by local electron imbalance E.M. LEVIN, A. HOWARD, U.S. DOE Ames Laboratory and Iowa State University, W.E. STRASZHEIM, Iowa State University — XRD, SEM, EDS, ^{125}Te NMR, Seebeck coefficient, and electrical resistivity of $Ag_xGe_{50-x}Te_{50}$ and $Sb_xGe_{50-x}Te_{50}$ alloys have been studied. Replacement of Ge in GeTe by Sb significantly increases the Seebeck coefficient, while replacement by Ag decreases it. These effects can be attributed to a change in carrier concentration observed via ^{125}Te NMR spin-lattice relaxation measurements and NMR signal position, which mostly depends on the Knight shift. Variation in carrier concentration in $Ag_xGe_{50-x}Te_{50}$ and $Sb_xGe_{50-x}Te_{50}$ can be attributed to different electron configurations of valence electrons of Ag ($4d^{10}5s^1$) and Sb ($5s^25p^3$) compared to that of Ge ($4s^24p^2$) resulting in local electron imbalances and changing the concentration of charge carrier (holes) generated by Ge vacancies. In contrast, our ^{125}Te NMR and Seebeck coefficient data for $Ag_2Sb_2Ge_{46}Te_{50}$ are similar to those observed for GeTe. This shows that effects from Ag and Sb compensate each other and indicates the existence of [Ag+Sb] pairs. The effects of Ge replacement in GeTe by Ag, Sb, or [Ag+Sb] on rhombohedral lattice distortion also have been analyzed. Interplay between the Seebeck coefficient and electrical resistivity in these alloys results in variation of power factor; the value of 45 mW/cm K^2, the highest among known tellurides, was found for $Sb_2Ge_{48}Te_{50}$.

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Date submitted: 11 Nov 2014 Electronic form version 1.4