Abstract Submitted
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Cr and Ru substituted defect manganese silicides $MnSi_\delta$ ($\delta \sim$ 1.72-1.74) as low thermal conductivity thermoelectrics* VIJAYABARATHI PONNAMBALAM, DONALD T. MORELLI, Dept. of Chemical Engineering & Materials Science, Michigan State University — Defect manganese silicides $MnSi_\delta$ ($\delta \sim$ 1.72-1.74) belong to a large family of compounds known as Nowotny chimney-ladder (NCL) phases and are closely related to an orthorhombic NCL compound $TiSi_2$. One interesting feature is the low lattice thermal conductivity ($\kappa_L \sim 2.5$ W/m K) which may be due to several reasons: Since δ doesn't exceed 1.75 in $MnSi_\delta$, a considerable concentration of random vacancies exists on the Si-sublattice and can give rise to a low thermal conductivity. In addition, as synthesized $MnSi_\delta$ is a mixture of many phases including Mn_4Si_7, $Mn_{11}Si_{19}$, $Mn_{15}Si_{26}$ and $Mn_{27}Si_{47}$ and in all these phases, while a-lattice parameter is closely matched, the c-lattice parameter substantially varies with δ. Such a closely matched a-lattice parameter can cause lattice strain and potentially reduce κ_L. Ru_2Si_3 forms solid solutions and Cr can be substituted as much as 20% in $MnSi_\delta$. These substitutions can favorably modify the lattice strain and reduce the thermal conductivity further. Hence manganese silicides substituted with small amounts of Cr and Ru have been synthesized. Thermoelectric properties including resistivity, Seebeck and Hall coefficients and thermal conductivity will be studied and presented. *This work was supported as part of the Center for Revolutionary Materials for Solid State Energy Conversion, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences under Award Number DE-SC0001054.

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