Abstract Submitted
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Doping CoSb3 p-type with Al substitution for Sb[1] MICHAEL J. ADAMS, MICHELE D. NIELSEN, Department of Mechanical Engineering, The Ohio State University, Columbus, OH, JOSEPH P. HEREMANS, Department of Mechanical Engineering, Department of Physics, The Ohio State University, Columbus, OH — Skutterudites such as $CoSb_3$ are compounds composed of group IX-B atoms (Co, Rh, and Ir) forming a simple cubic structure, and group V-A_3 pnictide atoms (primarily Sb and As) forming rings inside 6 of every 8 cubes. The remaining cubes remain empty. A common method for reducing thermal conductivity is to introduce impurity atoms such as rare-earths in the cubes that act as rattlers. P-type doping of $CoSb_3$ has led to some advances in zT, but the p-type material remains less performing than the n-type material due to the fact that the valence band, dominated by Sb levels, has a low effective mass. A promising method for improving p-type properties is to introduce an effective resonant level into the energy levels occupied by the light hole band, thereby increasing the Seebeck coefficient without strongly effecting other transport properties. A first attempt using Sn substitution was not successful. Here we try various concentrations of Al substituted at Sb sites to generate a resonant level. Material properties are measured and compared with a calculated Pisarenko relation, where thermopower is plotted as a function of hole concentration.

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