Abstract Submitted
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Potassium is a resonant level in $Bi_{1-x}Sb_x$ alloys[1] JOSEPH P. HEREMANS, The Ohio State University, Department of Mechanical and Aerospace Engineering, and Department of Physics, HYUNGYU JIN, The Ohio State University, Department of Mechanical and Aerospace Engineering, BARTLOMIEJ WIENDLOCHA, AGH University of Science and Technology, Faculty of Physics and Applied Computer Science, Krakow, Poland — $Bi_{1-x}Sb_x$ alloys are the most promising thermoelectric materials for cryogenic Peltier cooling. Resonant impurity levels are known to increase the thermoelectric power and figure of merit of semiconductors and known examples are Tl:PbTe [1] and Sn:Bi_2Te_3 [2]. Here we add K:$Bi_{1-x}Sb_x$ to that list. Band structure calculations show that substitutional potassium in bismuth can form sharp density of states peaks, suggesting the presence of a resonant level. Single crystal samples were synthesized by a modified horizontal Bridgeman-Hor method. Cryogenic thermoelectric transport data will be presented as a function of K and Sb concentrations. At certain concentrations, the addition of potassium has a large effect on the thermopower, and increases the figure of merit to reach zT = 0.7 at 100K with zT $>$ 0.5 at all temperatures from 50K up to room temperature, numbers are valid along the trigonal axis of single crystals. [1] J. P. Heremans & al. Energy Environ. Sci. DOI:10.1039/C1EE02612G; Science **321**, 554 (2008); [2] C.M. Jaworski & al., Phys. Rev. B **80**, 233201, (2009)

[1]AFOSR MURI "Cryogenic Peltier Cooling," FA9550-10-1-0533.

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