

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Exploration of effects of various impurities in Bismuth and its extension to Bismuth-Antimony alloys**<sup>1</sup> HYUNGYU JIN, KATHERINE WHITEHOUSE, Department of Mechanical Engineering, The Ohio State University, JOSEPH HEREMANS, Department of Mechanical Engineering and Department of Physics, The Ohio State University — While Te and Se are known donors and Pb and Sn known acceptors in elemental bismuth, little is known about other possible dopants. The effect of various impurities on thermoelectric properties of elemental bismuth is investigated here. Impurities investigated encompass the transition metals, group III and IV elements, and the chalcogens. The thermoelectric power, electrical resistivity and Hall coefficients of Bi samples doped with these impurities are measured from room temperature to 2K. Indium is found to be an acceptor, which is surprising because it is mostly trivalent. A calculation of the band structure subsequently performed at the AGH University of Science and Technology in Cracow reveals that In gives an excess density of states in the valence band. This finding in elemental Bi is extended to the case of bismuth-antimony alloys which have superior thermoelectric efficiency at cryogenic temperatures.

<sup>1</sup>This work is funded by MURI FA9550-10-1-0533.

Hyungyu Jin  
Department of Mechanical Engineering, The Ohio State University

Date submitted: 16 Nov 2010

Electronic form version 1.4