Abstract Submitted
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NbFeSb based p-type half-Heusler for power generation applications[1] GIRI JOSHI, GMZ Energy Inc, RAN HE, University of Houston, MICHAEL ENGBER, GMZ Energy Inc, GEORGY SAMSONIDZE, Robert Bosch LLC, TEJ PANTHA, EKRAJ DAHAL, GMZ Energy Inc, KESHAB DAHAL, University of Houston, JIAN YANG, GMZ Energy Inc, YUCHENG LAN, University of Houston, BORIS KOZINSKY, Robert Bosch LLC, ZHIFENG REN, University of Houston — We report a peak dimensionless figure-of-merit (ZT) of ˜1 at 700 ^{o}C in nanostructured p-type $Nb_{0.6}Ti_{0.4}FeSb_{0.95}Sn_{0.05}$ composition. Even though the power factor of the $Nb_{0.6}Ti_{0.4}FeSb_{0.95}Sn_{0.05}$ composition is improved by 25% in comparison to the previously reported p-type $Hf_{0.44}Zr_{0.44}Ti_{0.12}CoSb_{0.8}Sn_{0.2}$, the ZT value is not increased due to a higher thermal conductivity. However, the higher power factor of the $Nb_{0.6}Ti_{0.4}FeSb_{0.95}Sn_{0.05}$ composition led to a 15% increase in power output of a thermoelectric device in comparison to a device made from the previous best material $Hf_{0.44}Zr_{0.44}Ti_{0.12}CoSb_{0.8}Sn_{0.2}$. The n-type material used to make the unicouple device is the best reported nanostructured $Hf_{0.25}Zr_{0.75}NiSn_{0.99}Sb_{0.01}$ composition with the lowest hafnium (Hf) content. Both the p- and n-type nanostructured samples are prepared by ball milling the arc melted ingot and hot pressing the finely ground powders. Moreover, the raw material cost of the $Nb_{0.6}Ti_{0.4}FeSb_{0.95}Sn_{0.05}$ composition is more than six times lower compared to the cost of the previous best p-type $Hf_{0.44}Zr_{0.44}Ti_{0.12}CoSb_{0.8}Sn_{0.2}$. This cost reduction is crucial for these materials to be used in large-scale quantities for vehicle and industrial waste heat recovery applications.

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No Company Provided

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