World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:11, No:02, 2017

Thermoelectrical Properties of Cs Doped BiCuSeO as Promising Oxide Materials for Thermoelectric Energy Converter

Authors : Abdenour Achour, Kan Chen, Mike Reece, Zhaorong Huang

Abstract : Here we report the synthesis of pure and cost effective of BiCuSeO by a flux method in air, and the enhancement of the thermoelectric performance by Cs doping. The comparison between our synthesis and the usual vacuum furnace method has been studied for the pristine oxyselenides BiCuSeO. We report for very high Seebeck coefficients up to 516 μV K^{-1} at room temperature with the electrical conductivity of 5.20 S cm^{-1} which lead to a high power factor of 140 μW$m^{-1}K^{-2}$. We also report at the high temperatures the lowest thermal conductivity value of 0.42 μW$m^{-1}K^{-1}$. Upon doping with Cs, enhanced electrical conductivity coupled with a moderate Seebeck coefficient lead to a power factor of 338 μW$m^{-1}K^{-2}$ at 682 K. Moreover, it shows a very low thermal conductivity in the temperature range of 300 to 682 K (0.75 to 0.35 W$m^{-1}K^{-1}$). By optimizing the power factor and reducing the thermal conductivity, this results in a high ZT of ~ 0.66 at 682 K for Bi0.995Cs0.005CuSeO.

Keywords : BiCuSeO, Cs doping, thermoelectric, oxyselenide
Conference Title : ICEMSE 2017 : International Conference on Energy, Materials Science and Engineering
Conference Location : Venice, Italy
Conference Dates : February 16-17, 2017