

Designing and Fabrication of efficient nano-materials for thermoelectric generator

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Abstract

The electrical and thermal properties of the doped Tellurium Telluride ($\text{Ti}_{10}\text{Te}_6$) chalcogenide nano-particles are mainly characterized by a competition between metallic (hole doped concentration) and semi-conducting state. We have studied the effects of Sn doping on the electrical and thermoelectric properties of $\text{Ti}_{10-x}\text{Sn}_x\text{Te}_6$ ($1.00 \leq x \leq 2.00$), nano-particles, prepared by solid state reactions in sealed silica tubes and ball milling method. Structurally, all these compounds were found to be phase pure as confirmed by the x-rays diffractometry (XRD) and energy dispersive X-ray spectroscopy (EDS) analysis. Additionally crystal structure data were used to model the data and support the findings. The particles size was calculated from the XRD data by Scherrer's formula. The EDS was used for an elemental analysis of the sample and declares the percentage of elements present in the system. The thermopower or Seebeck co-efficient (S) was measured for all these compounds which show that S increases with increasing temperature from 295 to 550 K. The Seebeck coefficient is positive for the whole temperature range, showing p-type semiconductor characteristics. The electrical conductivity was investigated by four probe resistivity techniques revealed that the electrical conductivity decreases with increasing temperature, and also simultaneously with increasing Sn concentration. While for Seebeck coefficient the trend is opposite which is increases with increasing temperature. These increasing behavior of Seebeck coefficient leads to high power factor which are increases with increasing temperature and Sn concentration except For $\text{Ti}_8\text{Sn}_2\text{Te}_6$ because of lowest electrical conductivity but its power factor increases well with increasing temperature.

Biography:

Dr. Shah Completed his PhD degree in 2005, from Quaid-i-Azam U niversity, Islamabad, and postdoctoral study from University of Delaware, USA and University of Waterloo, Canada. He is the chairman of the department of Physics, International Islamic University, Islamabad. . He has published more than 25 papers in reputed journals and has been serving as an editorial board member of reputed. Dr Shah is the reviewer of the J of Alloys and Compounds, J. of Applied Physics, etc

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