Effect of Acceptor Impurity (Cu and Al) in Zn4Sb3 Thermoelectric Materials via Hot-isostatic Pressing (HIP) Method

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Abstract

This project investigates the influence of dopants use via hot-isostatic pressing (HIP) sintering technique on thermoelectric properties. A total of 8 samples weighing 3 g each at different compositions (Zn4-xMxSb3) (M = Cu, Al) (x = 0, 0.3, 0.6 at.%) were prepared via powder metallurgy technique and followed by HIP sintering process. The relative density of all the samples recorded 85-95% which is comparable to the published data. From the XRD results, a near single phase of Zn4Sb3 was obtained. The SEM images revealed a minor of porous surface exist and showed metallurgical bonding formed in the prepared samples. From thermoelectric properties characterization, Cu showed as an effective element to lower the electrical resistivity as compared to Al when Sample 6 (Zn3.4Cu0.6Sb3) recorded 16.18x10(-5) Omega m and Sample 8 (Zn3.4Al0.6Sb3) was 27.09x10(-5) Omega m. The results showed that HIP sintering technique at lower temperature compare to others studies offers potential processing route to produce a good thermoelectric material associated with the doping element.

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