

Hot-pressing –a recovery mechanism to severe plastically deformed ceramic BiCuSeO

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Severe plastic deformation processes are an excellent way to attain grain refinements and introduce dislocations in the material without compromising on the dimensions of the sample and **high-pressure torsion (HPT)** is a prime example of a severe plastic deformation process. In this work, HPT processing is employed to introduce a dense network of dislocation structures in BiCuSeO and subsequently using **hot-pressing (HP)** as a recovery sintering mechanism to minimize crack and fracture in the ceramic thereby increasing the mechanical integrity while retaining the effects of the HPT. This methodology was represented as **HPT-HP** process. The effect of pressure and strain from the HPT-HP processing results in a reduction in the bandgap of the material BiCuSeO from 0.83 eV (HP) to 0.74 eV (HPT-HP1). The best HPT-HP condition was then taken forward for Pb-substitution to achieve a similar effect. The shear deformation from the HPT creates increased levels of dislocation density of about $5.02 \times 10^{16} \text{ m}^{-2}$ in HPT-HP Bi_{0.94}Pb_{0.06}Cu_{0.97}SeO sample. These dislocations along with their corresponding lattice strains reduce the lattice part of thermal conductivity to a low 0.36 W/mK at 823 K while simultaneously having the reduced bandgap effect and positively observing 145.5 S/cm electrical conductivity in the HPT-HP Bi_{0.94}Pb_{0.06}Cu_{0.97}SeO sample, resulting in a zT of 1.11.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

Yes

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