The effect of rare earth dopants on the of Perovksite materials for thermoelectric applications

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Abstract:

Thermoelectrics is one of the promising technologies to generate electricity from waste heat which is coming out from industries and automobiles. The performance of a thermoelectric material is based on the electrical and thermal conductivity of the material. Bismuth telluride is one of the well-known thermoelectric material for low temperature applications. Oxide materials are highly useful for high temperature thermoelectric applications. Metal oxides based Perovskite have attracted high attentions as a novel thermoelectric material due to their excellent tunable electrical conductivity. In the present work $Ba_{1-x}La_xSnO_3$ and $Ba_{1-x}Sr_xSnO_3$ materials were prepared with x=0,0.02,0.06,0.1 by polymerization complex(PC) method and pellets of the prepared materials were made using high pressure and high temperature sintering (HPHTS) method. The synthesized materials were characterized by XRD, SEM and TEM analysis for studying their structural and morphological properties. XRD analysis revealed the mixed phases of tin oxide and $Ba_{1-x}Sr_xSnO_3$ perovskite structure. The SEM images of $Ba_{1-x}La_xSnO_3$ shows spherical like morphology whereas $Ba_{1-x}Sr_xSnO_3$ and $BaSnO_3$ shows rod like morphology with diameter of 10 to 15 nm. The Seebeck coefficient (S) of the samples was measured as a function of temperature. The Seebeck coefficient (Fig 1) $Ba_{1-x}La_xSnO_3$ is relatively higher than that of $BaSnO_3$ and $Ba_{1-x}Sr_xSnO_3$ especially at the high temperature.

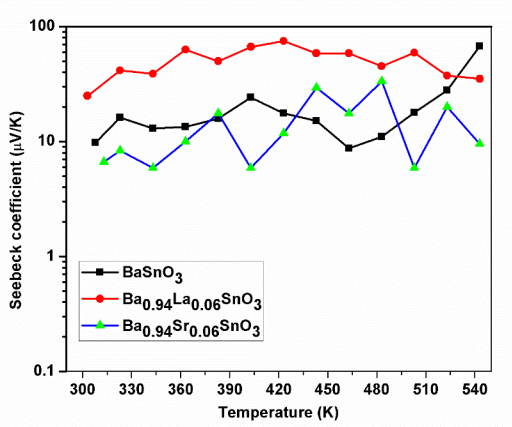

Fig 1.Seebeck Coefficient as a function of temperature.

Key Words: Perovskite, Thermoelectric, Seebeck coefficient, XRD, SEM,TEM.