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Thickness Dependence Electric and Thermoelectric Properties of Thermally Evaporated Nanostructured Bismuth Selenide Thin Films

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Abstract: *This paper investigates the thermoelectric and electrical characteristics of bismuth selenide (Bi_2Se_3) thin films, a promising topological insulator, at various thicknesses. We reveal how precise control over growth parameters can significantly influence carrier mobility, which is critical for optimizing the material's thermoelectric figure of merit. The Bi_2Se_3 films of various thicknesses have been prepared by thermal evaporation technique at room temperature and then annealed in vacuum ($\approx 10^{-5}$ torr). All the film samples of annealed Sb_2Te_3 thin films have positive temperature coefficients of resistivity, which suggested their conducting nature. The resistivity decreases with increasing film thickness for all the samples, it varies from 0.627 to 2.114 mΩ cm. Thermo emf as well as thermoelectric power of Sb_2Te_3 thin films found to be positive for all thicknesses indicating that Sb_2Te_3 is p-type material. The Seebeck coefficient shows oscillatory behavior with the film thickness.*

Keywords: Thermal evaporation**,** thermo emf, thermoelectric power, resistivity, Seebeck coefficient