Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Thermoelectric power factor of topological insulator $\mathbf{Bi_{2-x}Sb_xTe_{3-y}Se_y}$ TE CHIH HSIUNG, TING YUAN CHEN, LI ZHAO, YI HSIN LIN, YANG YUAN CHEN, Institute of Physics, Academia Sinica, Taipei, Taiwan — Topological insulator (TI) is a new quantum material. The surface states of TIs are protected by time-reversal symmetry which allows charge carrier to propagate on the edge of surface conducting channel without scattering. $Bi_{1.5}Sb_{0.5}Te_{1.7}Se_{1.3}$ is a well-known TI [1] and thermoelectric material because of its promising thermoelectric performances at room temperature. The conversion efficiency of thermoelectric material is characterized by the dimensionless figure of merit ZT. Decades of effort were devoted to ZT optimization either through composition alteration or nanostructure fabrication. In this study, the temperature dependence of resistance of bulk (exfoliated specimen with 140 μm thickness) shows semiconductor behavior (0.04 Ω cm at 300 K) without saturating regime in lower temperatures. In contrast, its nanoflake counterpart (100-500 nm) [2] shows a transition from semiconductor to metallic behavior near 100 – 150 K with decreasing temperature and saturation at 10 K. Surface contribution to the total conductance of exfoliated specimens was acquired through Hall effect measurements in the magnetic field ranging from -9 to 9 Tesla. Surface contribution of BSTS samples increases from 3% to 70% as thickness decreases from 140 to 7 μm. In this work, we report a systematic study of thermoelectric power factor for various thicknesses of BSTS specimens to examine the thermoelectric power factor of their surfaces.

[1] Zhi Ren et al., Phys. Rev. B 84, 165311 (2011).
[2] Bin Xia et al., e-print arXiv1203.2997

Te Chih Hsiung
Institute of Physics, Academia Sinica, Taipei, Taiwan

Date submitted: 15 Nov 2012 Electronic form version 1.4