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Thermoelectric transport of edge/surface states of topological insulators SHUICHI MURAKAMI, Department of Physics, Tokyo Institute of Technology and PRESTO-JST, RYUJI TAKAHASHI, Department of Physics, Tokyo Institute of Technology — In my talk we theoretically study thermoelectric properties of topological insulators (TI) [1], where novel properties of edge/surface states are expected to appear. As compared to the number of bulk states, the edge/surface states are very few; we therefore consider a narrow ribbon for 2D and a thin slab for 3D TI to make the edge/surface-state transport larger. By considering edge/surface and bulk transport together, we calculate the charge and heat conductivity, and Seebeck coefficient. We find that in 2D TI the bulk and edge transport compete each other in the thermoelectric transport. By lowering temperature, the thermoelectric figure of merit ZT has a minimum, corresponding to the bulk-to-edge crossover, and then increases again at low temperature where the edge state dominates. The crossover is estimated to be at around 5K-10K for 10nm-width ribbon. We also discuss surface state transport for 3D TI as well.

[1] R. Takahashi and S. Murakami, Phys. Rev. B81, 161302 (R) (2010).
[2] S. Murakami, R. Takahashi, O. A. Tretiakov, Ar. Abanov, J. Sinova, arXiv:1010.2304.

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