Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Carrier control via charge transfer at the topological-insulator/organic-molecule interface KATSUMI TANIGAKI, AIMR, Tohoku University, YOICHI TANABE, KHUONG KUYNH, TAKAHIRO URATA, Department of Physics, Graduate School of Science, Tohoku University, RYO NOUCHI, Center of Nano Science and Technology, Osaka Prefecture University, SATOSHI HEGURI, HIDEKAZU SHIMOTANI, Department of Physics, Graduate School of Science, Tohoku University, AIMR, TOHOKU UNIVERSITY COLLABORATION, DEPARTMENT OF PYSICS, GRADUATE SCHOOL OF SCIENCE, TOHOKU UNIVERSITY COLLABORATION[1], OSAKA PREFECTURE UNIVERSITY COLLABORATION — A topological insulator is a material that behaves as an insulator as a bulk state, while permitting metallicity on its Dirac cone surface state. One of the most serious issues of recent researches in this field, however, has been the fact that the Fermi levels in many TIs actually fall in either the conduction or valence band due to the naturally occurring defects and must be controlled by further doping. We report here that the major electron carriers on the SS of a $Bi_{2-x}Sb_xTe_{3-y}Se_y$(BSTS) single crystal can be converted to the hole carriers via interface control using 2,3,5,6-tetrafluoro-7,7,8,8-tetracyanoquinodimethane(F4-TCNQ), with strong electron affinity. The evidence can be elucidated using a detailed three-carrier model. The results apparently demonstrate that the charge transfer at the TI/organic-molecule interface is very efficient in order to control the carrier density of TIs, particularly on the SS. Our present results will be very important for studying the fundamental aspects of TIs as well as their future device applications.

[1]Osaka Prefecture University

Katsumi Tanigaki
AIMR, Tohoku University

Date submitted: 09 Nov 2012 Electronic form version 1.4