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**Quantum Hall Effect on Surface States of Topological Insulator $(Bi_{1-x}Sb_x)_2Te_3$ Thin Films** RYUTARO YOSHIMI, University of Tokyo, ATSUSHI TSUKAZAKI, Tohoku University, YUSUKE KOZUKA, JOSEPH FALSON, University of Tokyo, KEI TAKAHASHI, RIKEN CEMS, JOSEPH CHECKELSKY, Massachusetts Institute of Technology, NAOTO NAGAOSA, MASASHI KAWASAKI, YOSHINORI TOKURA, RIKEN CEMS — The three-dimensional (3D) topological insulator (TI) is a novel state of matter as characterized by two-dimensional metallic Dirac states on its surface. Quantum transport in Dirac systems has been attracting much attention for the half-integer quantum Hall effect (QHE), as typically observed in graphene. Unlike the case of graphene, the Dirac states of TIs have no degeneracy including spin degree of freedom. Instead, both top and bottom surfaces host Dirac states with opposite spin-momentum locked modes. Such a helicity degree of freedom in real space is expected to yield intriguing quantum phenomena in 3D TIs. Bi-based chalcogenides such as $Bi_2Se_3$, $Bi_2Te_3$, $Sb_2Te_3$ and their compounds are candidates where the Dirac features can be detected via quantum transport phenomena in thin films form. Here, we report the realization of the QHE on the surface Dirac states in $(Bi_{1-x}Sb_x)_2Te_3$ films ($x$ =0.84 and 0.88). With electrostatic gate-tuning of Fermi level under magnetic fields, QH states with filling factor $\nu = \pm 1$ are resolved with quantized Hall resistance of $R_{yx} = \pm h/e^2$ and zero $R_{xx}$, owing to the chiral edge modes at top/bottom surface Dirac states. The significant technical advance in 3D TI films may pave a way toward TI-based electronics.

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