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Experimental Realization of Three-dimensional Topological Insulator in Ternary Chalcogenides K. KURODA, M. YE, A. KIMURA, Hiroshima Univ., Y. UEDA, Kure Nat. Coll. Tec., S.V. EREMEEV, Tomsk State Univ., E.E. KRASOVSKII, E.V. CHULKOV, DIPC, K. MIYAMOTO, T. OKUDA, K. SHIMADA, H. NAMATAME, M. TANIGUCHI, Hiroshima Univ. — Three-dimensional topological insulators (TIs) featured with spin-helical massless surface state have attracted a great attention. Up to now, the experimentally confirmed topological insulators are limited to some binary compounds, such as Bi_2Te_3, Bi_2Se_3 and so on. Recently, several ternary chalcogenides have been proposed as a new family of TI. In contrast to the layered binary chalcogenides, in ternary chalcogenides with a more substantial three dimensional character, the surface state depends on the topmost layer because the broken bonds at the surface may give rise also to trivial surface state. Therefore, the experimental realization of non-trivial surface state in TI has been strongly required. In this work, we have performed an angle resolved photoemission spectroscopy by using synchrotron radiation to prove the surface state in the ternary compounds. Especially, for one of the candidate materials, $TlBiSe_2$, two important aspects have been revealed: (i) The Dirac cone is more ideal than that of Bi_2Se_3. (ii) There are no bulk continuum states that energetically overlap with the Dirac point. This means that the scattering channel from the topological surface state to the bulk continuum is strongly suppressed in $TlBiSe_2$.

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