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Controlling the topological states of Bi_2Se_3 by silver atom intercalation M. YE, K. KURODA, M. NAKATAKE, S. KIM, Y. YAMADA, A. KIMURA, K. MIYAMOTO, M. ARITA, T. OKUDA, K. SHIMADA, Hiroshima University, Y. UEDA, Kure National College of Technology, H. NAMATAME, M. TANIGUCHI, Hiroshima University — Among the known topological insulators, the layered material, Bi_2Se_3, is one of the most promising candidates for potential applications to ultra-low power consumption quantum devices that can work stably at room temperature due to a sufficiently large energy gap in the bulk. The realization of quantum devices generally requires the exposure of the materials to ambient conditions, which significantly disturbs the topological properties through absorption. While intercalation of impurities into layered materials might be thought to be usually detrimental, we show here that that intercalation of Ag into Bi_2Se_3 has a benefit. After depositing silver atoms on the surface of Bi_2Se_3, massive electrons can be formed on the surface due to the decoupling of the layer-structure by silver intercalation. The newly formed massive electron observed on the surface serves as an evidence of an extremely weak interaction between the decoupled layers and the bulk TI crystal. These results strongly suggest the existence of a new non-trivial boundary state, which opens a pathway to realizing topological insulator-based electronic and spintronic devices, and fault tolerant quantum computation.

M. Ye
Hiroshima University

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