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Unidirectional spin Hall magnetoresistance in topological insulator/ferromagnetic layer heterostructures. JAMES KALLY, The Pennsylvania State University, YANG LV, DELIN ZHANG, Univ of Minnesota - Twin Cities, JOON SUE LEE, NITIN SAMARTH, The Pennsylvania State University, JIAN-PING WANG, Univ of Minnesota - Twin Cities, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, UNIVERSITY OF MINNESOTA, MINNEAPOLIS COLLABORATION, DEPARTMENT OF PHYSICS, THE PENNSYLVANIA STATE UNIVERSITY COLLABORATION — The surface states of topological insulators offer a potentially very efficient way to generate spins and spin-orbit torques to magnetic moments in proximity. The switching by spin-orbit torque itself only requires two terminals so that a charge current can be applied. However, a third terminal with additional magnetic tunneling junction structure is needed to sense the magnetization state if such devices are used for memory and logic applications. The recent discovery of unidirectional spin Hall magnetoresistance in heavy metal/ferromagnetic and topological insulator/magnetically doped topological insulator systems offers an alternative way to sense magnetization while still keeping the number of terminals to minimal two. The unidirectional spin Hall magnetoresistance in topological insulator/strong ferromagnetic layer heterostructure system has yet not been reported. In this work, we report our experimental observations of such magnetoresistance. It is found to be present and comparable to the best result of the previous reported Ta/Co systems in terms of magnetoresistance per current density per total resistance.

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