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Magnetoanisotropic tunneling transport in topological insulators[1]

ALEX MATOS ABIAGUE, University at Buffalo, BENEDIKT SCHARF, University of Regensburg, JONG E. HAN, IGOR ZUTIC, University at Buffalo — We investigate the anisotropy of the tunneling transport with respect to the magnetization orientation of a magnetic barrier on a topological insulator surface. The spin-momentum locking of the topological surface states lead to large changes in the magnetoresistance (MR) when the magnetization is rotated in the plane of the surface. In contrast to the small tunneling anisotropic MR (TAMR) expected for topologically trivial Rashba states [1], the large values of TAMR predicted here suggest that the Edelstein effect [2] leads to a highly efficient spin polarization of the topological states [3]. The Hall voltage resulting from the tunneling planar Hall effect [4] also exhibits a strong magnetoanisotropy. Due to resonant effects inherent to Klein tunneling, the Hall voltage changes sign not only under magnetization reversal, but also when the magnetization orientation is slightly shifted around certain directions.

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