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Magnetoelectric effect in topological insulator/magnetic layer nanostructure YURIY SEMENOV, KI WOOK KIM, North Carolina State University — The topological insulator (TI) surface band structure can be modified by contacting ferromagnetic layers due to the proximity exchange interaction. When the magnetization **M** is in the in-plane direction, the proximate exchange interaction results in a shift of the Dirac cone in the momentum space, whereas an energy gap can be generated for out-of-plane orientation culminating the maximum value at perpendicular to plane direction. Such opening of energy gap lowers the valence electron energy that can be only partially compensated by increase of the conduction electron energies depending on chemical potential μ. Such correlation of electronic energy and magnetization direction open up a new way toward the electrical manipulation of **M**. To quantitative estimation of this effect, we provide the thermodynamic potential calculation of the TI surface electrons interacted with proximate ferromagnetic insulator as a function of **M** rotation by angle θ about in-plane axis **x**. The result can be described as an additive magnetic energy $E = K_{eff}(\mu)sin^2\theta$ in the form of uniaxial anisotropy, which is induced by interaction with TI surface electrons. In the case of TI Bi_2Se_3, the numerical estimations predict the $K_{eff}(\mu)$ variation in the range of 1 meV/nm^2 if μ vary over 100 meV. The possible applications of the effect (memory and logic) are discussed.

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