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A self-consistent study of the ferromagnetic ordering of magnetic adatoms on the surface of topological insulator[1] WEI QIN, ZHENYU ZHANG, University of Science and Tech of China — Ferromagnetically coupled magnetic adatoms on the surface of a three-dimensional topological insulator (TI) will induce a band gap by breaking time-reversal symmetry. The opened gap not only causes a lowering of the total energy of the band electrons, but also influences the magnetic coupling between the magnetic adatoms; in turn, variations in the magnetic coupling will affect the original collective magnetic states of the adatoms on the TI surface. We study *self-consistently* the RKKY interactions between magnetic adatoms on a TI surface, mediated by massive Dirac electrons. Analytical expressions of RKKY interactions are presented, which contain the widely known Heisenberg-like, Ising-like, and DM-like terms [1]. Our results show that the self-consistent band gap will weaken the ferromagnetic couplings between the magnetic adatoms. Finally, we expand our study to the case that magnetic adatoms interact with the surface electrons of TI via anisotropic exchange couplings.

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