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Strong single-ion anisotropy and anisotropic interactions of magnetic adatoms induced by topological surface states[1] ZHENGLU LI, JIHUI YANG, GUOHONG CHEN, Departmenf of Physics, Fudan University, M.-H. WHANGBO, Department of Chemistry, North Carolina State University, HONGJUN XIANG, XINGAO GONG, Departmenf of Physics, Fudan University
— The nature of the magnetism brought about by Fe adatoms on the surface of the topological insulator Bi_2Se_3 was examined in terms of density functional calculations. The Fe adatoms exhibit strong easy-axis magnetic anisotropy in the dilute adsorption limit due to the topological surface states (TSS). The spin exchange J between the Fe adatoms follows a Ruderman-Kittel-Kasuya-Yosida behavior with substantial anisotropy, and the Dzyaloshinskii-Moriya interaction between them is quite strong with $|D/J| \approx 0.3$ under the mediation by the TSS, and can be further raised to 0.6 by an external electric field. The apparent single-ion anisotropy of a Fe adatom is indispensable in determining the spin orientation.

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