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Ferromagnetic resonance study of interlayer exchange coupling in topological insulator/ferrimagnetic insulator heterostructures Y. T. FANCHIANG, Dept. of Physics, National Taiwan Univ., H. Y. LIN, C. C. TSENG, K. S. CHEN, C. N. WU, Dept. of Physics, National Tsing Hua Univ., C. K. CHENG, Dept. of Physics, National Taiwan Univ., S. F. LEE, Institute of Physics, Academia Sinica, J. G. LIN, Center for Condensed Matter Sciences, National Taiwan Univ., M. HONG, Dept. of Physics, National Taiwan Univ., J. KWO, Dept. of Physics, National Tsing Hua Univ. — Introducing magnetic order in topological insulators via magnetic proximity coupling when in contact with a ferrimagnet is a promising way to realize novel topological physics such as quantum anomalous Hall effect. We have performed ferromagnetic resonance (FMR) of heterostructures made of yttrium iron garnet (YIG) films of varying thickness (15-30 nm) and Bi_2Se_3 films (25 QL) from 300 K down to 5 K. Frequency- and angle-dependent FMR show sizable Bi_2Se_3-induced effective field in bilayer samples at room temperature, which is manifested as enhanced in-plane magnetic anisotropy over that of single layer YIG. The origin of such magnetic anisotropy occurring at interface is clarified by the YIG thickness dependence study. As the temperature decreases, the exchange effective field builds up pronouncedly and the FMR remains detectable. Specifically, for the bilayer sample of thin YIG (15 nm), the exchange effective field can induce FMR at microwave frequency of at least 3.5 GHz in absence of applied field below 50 K. Our study reveals the role of strong interlayer exchange coupling between Bi_2Se_3 and YIG in magnetization dynamics, leading to potential field-free spintronics application.

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