Magnetic Circular Dichroism from Exchange Splitting in Intrinsic Magnetic Topological Insulator MnBi2Te4

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MnBi2Te4 has attracted significant attention due to exhibit both its non-trivial topology and its magnetism, which give rise to interesting phenomena such as the quantum anomalous Hall effect [1-3] and the axion insulator effect [4]. However, most studies have focused on the properties of its surface states while its bulk-originated bands have remained relatively understudied. In this study, we report recent magnetooptical infrared spectroscopy measurements conducted on the intrinsic magnetic topological insulator MnBi2Te4. We carried out infrared absorption measurements under magnetic fields up to 34 T and observed an optical absorption in the mid-infrared that shifts to higher energy as the magnetic field increases. The energy of the transition versus magnetic field reflects the behavior of the anomalous Hall effect.The transition energy increases through the canted magnetic state of MnBi2Te4 and then saturates at 8 T when the system enters a ferromagnetic state. Then, the transition energy further increases when the magnetic field is above 25 T, where the magnetization of Mn antisite defects is likely to start flipping. Additionally, this absorption displays a strong magnetic circular dichroism, which likely originates from band splitting under the effect of magnetic exchange. Our studies not only reveal the infrared response of MnBi2Te4 but also provide insight into how the electronic structure changes through the phase diagram of this material, consistently following the behavior of the magnetization.

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