Anomalous Hall effect in IV-VI semiconductors

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9.7 cm

In ferromagnetic metals and magnetic semiconductors, the off-diagonal conductivity is proportional to the external magnetic field, which is connected with ordinary Hall effect, and an additional term which is proportional to the magnetization of the sample and does not disappear at zero magnetic field. This extraordinary term is known as the anomalous Hall effect (AHE). The origin of the AHE is the spin-orbit interaction in the presence of spin polarization. There are two groups of mechanisms that are responsible for AHE: so called extrinsic mechanisms (skew scattering and side jump) and intrinsic mechanisms which are related to the topology of electron energy bands.

We consider narrow-gap IV-VI magnetic semiconductors where the relativistic terms are not small and determine both the non-parabolicity of the energy spectrum and strong spin-orbit interaction. We use the relativistic Dirac model and the theory of linear response to calculate the topological contribution to the off-diagonal anomalous Hall conductivity. We also present some experimental data and make the comparison of numerical and experimental results. Owing to this, we can estimate the magnitude of intrinsic contribution to AHE in IV-VI magnetic semiconductors.

13.4 cm

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