Topological Hall effect in heterostructures of ferromagnetic material/non-coplanar antiferromagnetic material

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Abstract

Chiral spin structures play key roles in spintronics and recent progresses are being made on magnetic skyrmion structures [1]. Dzyaloshinskii–Moriya interaction (DMI) in magnetic materials or heterostructures of strong spin-orbit coupling materials and ferromagnetic materials can generate topological Hall effect implying the existence of skyrmion. In this study, we present a large topological Hall effect in heterostructures of Cr_2Te_3 (ferromagnet) and Cr_2Se_3 (non-coplanar antiferromagnet) grown by the molecular beam epitaxy. Density function theory calculations confirm that the interface can enhance the DMI [2]. We believe that our study paves a way to manipulate the DMI and generate skyrmions in familiar magnetic heterostructures.

References

[1] Albert Fert et al., Nature Reviews Materials, 2 (2017), 17031
[2] Jae Ho Jeon et al., ACS Nano, 16 (2022), 8974-8982

Figures

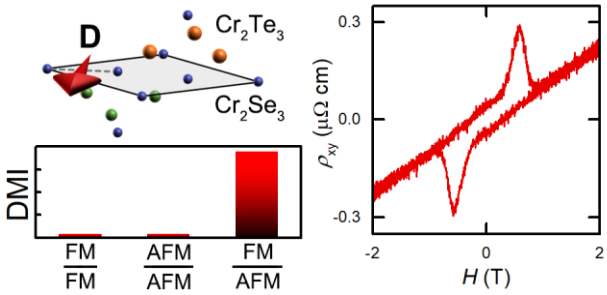

Figure 1: Strength of Dzyaloshinskii–Moriya interaction and topological Hall resistivity in heterostructure of Cr_2Te_3/Cr_2Se_3.