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Interface tunable magnetism in quasi-two-dimensional chromium telluride

Wednesday, May 29, 2024 4:00 PM (30 minutes)

Novel quasi-2D magnets are attracting much attention recently. The MBE synthesis route is highly desirable for interface control when implementing strain engineering and/or hybridizing with other quantum systems. *In situ* prepared atomically sharp interfaces further enable fundamentally new phenomena, while providing opportunities in spintronics, leveraging interface-driven versatility [1]. Ferromagnetic Cr_2Te_3 ultrathin films, optimally grown on $\text{Al}_2\text{O}_3(0001)$ and $\text{SrTiO}_3(111)$, manifest an extraordinary sign reversal in the anomalous Hall conductivity as temperature and/or strain are modulated. It turns out that the nontrivial Berry curvature in the electronic-structure momentum space is responsible for this exotic behavior [2]. Moreover, when proximitized with $(\text{Bi,Sb})_2\text{Te}_3$ -type topological insulator, via the Bloembergen-Rowland interaction, magnetic ordering in monolayer Cr_2Te_3 is favorably enhanced, displaying an increased Curie temperature [3]. Combining advanced scanning tunneling microscopy, magnetic force microscopy, transmission electron microscopy, depth-sensitive polarized neutron reflectometry, magnetotransport and *ab initio* simulation, Cr_2Te_3 has been established as a far-reaching platform for further investigating the marriage of magnetism and topology, in both real and reciprocal spaces. These findings provide new perspectives to the magnetic topological materials in general, that are topical for the future development of topological spintronics.

References

- [1] H. Chi and J. S. Moodera, "Progress and prospects in the quantum anomalous Hall effect", *APL Mater.* 10, 090903 (2022). <https://doi.org/10.1063/5.0100989>
- [2] H. Chi, Y. Ou, T. B. Eldred, W. Gao, S. Kwon, J. Murray, M. Dreyer, R. E. Butera, . . . J. S. Moodera, "Strain-tunable Berry curvature in quasi-two-dimensional chromium telluride", *Nat. Commun.* 14, 3222 (2023). <https://doi.org/10.1038/s41467-023-38995-4>
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Keyword-1

Berry curvature

Keyword-2

Transition Metal Chalcogenide

Keyword-3

Topological Insulator

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| Fluctuations, interactions et désordre dans la matière condensée (DPMCM)

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