



IFMP Seminar

Date Tuesday, October 11, 2022, at 14:50

REC/C213

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<https://selfservice.zih.tu-dresden.de/l/link.php?m=188417&p=0c384d8f> (TUD)

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Speaker **Helena Reichlova**

TU Dresden, IFMP and IOP, Czech Academy of Sciences

Title **Spontaneous Hall Effect in MnTe and Mn₅Si₃ Thin Films**

Abstract The spontaneous Hall effect has long been studied in ferromagnets and used to be commonly associated with magnetization. More recent developments of the intrinsic spontaneous Hall effect have predicted the phenomenon in systems with suppressed magnetization. It has been subsequently observed in antiferromagnetic crystals with geometrically frustrated lattices and/or typically exotic and rather strongly relativistic elements [1]. The family of materials that can exhibit the spontaneous Hall effect has been significantly expanded by so-called altermagnets with alternating spin polarizations in both crystal-structure real space and electronic-structure momentum space. [2,3]

I will first present our experimental observation of a spontaneous anomalous Hall response in the absence of an external magnetic field in an altermagnetic film of MnTe, which is a semiconductor with a collinear antiparallel magnetic ordering of Mn moments [4]. I will then present our observation of the spontaneous anomalous Hall effect in epitaxial thin-film Mn₅Si₃ [5] grown on a Si(111) substrate. The epitaxial constraints stabilize a hexagonal unit cell in the magnetic state distinct from previously described phases in bulk Mn₅Si₃ crystals, leading to altermagnetism and a sizable spontaneous anomalous Hall conductivity of 5-20 S/cm, accompanied by a negligible net magnetization. Our results demonstrate the possibility of studying the topology of bands with broken time-reversal symmetry in crystals with unfrustrated lattices and weakly relativistic abundant elements.

[1] Nakatsuji and Arita, Annual Review of CMP **13** :119-142 (2022)

[2] Smejkal *et al.* Science Advances **6**, 23 (2020); Mazin *et al.* PNAS **118** 42 (2021)

[3] Smejkal *et al.* Phys. Rev. X **12**, 031042 (2022)

[4] Gonzales-Betancourt *et al.* arXiv:2112.06805

[5] Reichlova H. *et al.*, arXiv:2012.15651

Host: D. Peets