Dresden University of Technology

Faculty of Physics

PHYSICS COLLOQUIUM

Speaker: **Dr. Dominik Kriegner**
Group Leader & Head,
Laboratory of Magnetron Sputtering,
Institute of Physics,
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Prague,
Czech Republic

Topic: **Altermagnetic Thin Films: From Spin-Split Electronic States to Superconducting Spintronics**

Time and place: Tuesday, December 1, 2026, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.
Online participation possible:
Zoom-Meeting: Meeting-ID: 642 8554 1414 / passcode: w8$nSJjy
https://tu-dresden.zoom-x.de/j/64285541414?pwd=6UOwTkSBlWvNv16PgF2K1qZtoUC8cS.1

Host: Prof. Carsten Timm

Abstract: Altermagnets are compensated collinear magnets that combine vanishing net magnetization with strongly spin-split electronic bands whose polarization alternates in momentum space [1]. This unusual combination enables spin-dependent electronic and transport phenomena without macroscopic magnetization. In this talk, I will discuss our experimental progress in establishing altermagnetism in epitaxial thin films. Starting from MnTe, I will show how magnetic symmetry connects to spin-split electronic structure, magnetic domains, and electrical and thermoelectric transport [2-4]. I will then turn to metallic CrSb and to our efforts to expand the available thin-film materials platform and generate spin-polarized currents from compensated magnets [5,6]. Finally, I will discuss a new direction in which compensated magnetism is combined with superconductivity. In CuMnAs/Al heterostructures, we demonstrate a field-free superconducting diode effect whose polarity is controlled by reversal of the antiferromagnetic Néel vector, showing that compensated collinear antiferromagnetic order can directly control non-reciprocal superconducting transport [7]. In parallel, superconducting epitaxial PtSb and PtSb/CrSb heterostructures establish a materials platform for investigating how the non-relativistic, momentum-dependent spin splitting of altermagnets couples to superconductivity [8].

[1] L. Šmejkal, J. Sinova, and T. Jungwirth, Phys. Rev. X 12, 031042 & 040501 (2022).
[2] R. D. Gonzalez Betancourt et al., Phys. Rev. Lett. 130, 036702 (2023).
[3] J. Krempaský et al., Nature 626, 517-522 (2024).
[4] O. J. Amin et al., Nature 636, 348-353 (2024).
[5] S. P. Bommanaboyena et al., Phys. Rev. Materials 9, 064402 (2025).
[6] J. Mencos et al., arXiv:2512.17427 (2025).
[7] F. Krizek et al., arXiv:2609.38003 (2026).
[8] C. Müller et al., Phys. Rev. Materials 10, 094801 (2026).

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Bio: Dominik Kriegner is a group leader and head of the Laboratory of Magnetron Sputtering at the Institute of Physics of the Czech Academy of Sciences in Prague. He received his PhD in Technical Physics from Johannes Kepler University Linz in 2013. His research focuses on epitaxial magnetic thin films and heterostructures, combining thin-film growth, structural characterization, magnetotransport, and synchrotron-based techniques. His recent work has contributed to the experimental development of altermagnetism in MnTe and CrSb and to establishing compensated-magnet/superconductor heterostructures for superconducting spintronics.