

SEMINARIUM Z MAGNETYZMU I NADPRZEWODNICTWA

Uprzejmie zawiadamiamy, że w **środe**

9 kwietnia 2025 r., o godz.10:00

odbędzie się seminarium w sali 203, budynek I
na którym

Jakub Polaczyński

(International Research Center MagTop, Institute of Physics, Polish Academy of Sciences)

wyłosi referat na temat:

„Nietrywialne topologiczne fazy wywołane naprężeniami w epitaksjalnych warstwach szarej cyny”

Jakub Polaczyński¹, G. Krizman², A. Kazakov¹, B. Turowski¹, J. Bermejo Ortiz³, R. Rudniewski¹, T. Wojciechowski¹, P. Dłużewski⁴, M. Aleszkiewicz⁴, W. Zaleszczyk¹, B. Kurowska⁴, M. Rosmus⁵, N. Olszowska⁵, L.-A. de Vaultier³, Y. Guldner³, T. Wojtowicz¹, V.V. Volobuev¹

¹*International Research Center MagTop, Institute of Physics, Polish Academy of Sciences*

²*Institut für Halbleiter und Festkörperphysik, Johannes Kepler Universität, Linz*

³*Laboratoire de Physique de l'École Normale Supérieure, Sorbonne Université, Paris*

⁴*Institute of Physics, Polish Academy of Sciences*

⁵*Narodowe Centrum Promieniowania Synchrotronowego SOLARIS, Kraków*

Grey tin, also known as α -Sn, is a nominally zero-gap semiconductor stable below 13°C, in which various topological phases can be induced by external strain [1, 2]. In particular, the application of biaxial compressive strain transforms α -Sn into a topological Dirac semimetal (DSM), which can be further converted into a Weyl semimetal (WSM) via an external magnetic field. One effective method of strain engineering is molecular beam epitaxy (MBE) on a lattice-matched substrates, which also stabilizes the α -Sn phase at room temperature and above.

During this seminar, we will present comprehensive experimental results on both DSM and WSM phases observed in epitaxial layers of grey tin grown by MBE on hybrid CdTe/GaAs substrates. Compressive strain and high crystalline quality of the samples were confirmed by X-ray diffraction, transmission electron microscopy, and atomic force microscopy. The DSM phase was verified by band structure calculations based on magneto-optical measurements and directly observed via angle-resolved photoemission spectroscopy.

A rich set of magnetotransport phenomena was observed, highlighting the topologically non-trivial nature of the charge carriers. We will focus on Shubnikov-de Haas oscillations exhibiting a π Berry phase, as well as the observation of negative longitudinal magnetoresistance - both consistent with the presence of the chiral anomaly in the WSM phase [3]. Additionally, we will present anisotropic magnetoresistance and the planar Hall effect, further supporting the topological character of the material.

Altogether, our findings establish grey tin as a model system for studying 3D topological semimetals, with potential applications in spintronics and topological electronics.

[1] Liang Fu and Charles Kane, *Phys. Rev. B* **76** (2007), 045302

[2] Huaquing Huang and Feng Liu, *Phys. Rev. B* **95** (2017), 201101(R)

[3] Jakub Polaczyński et al., *Materials Today* **75**, 135 (2024)

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**Wykład będzie prowadzony w języku polskim w sali 203, slajdy będą w języku angielskim.
Dostępna będzie również transmisja ZOOM - link podany jest na stronie IF PAN.**

Serdecznie zapraszamy

Roman Puźniak / Andrzej Szewczyk / Henryk Szymczak