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Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme
Fachbereich Physik, Universität Stuttgart

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Hybrid

Login data will be announced by e-mail and on the colloquium webpage.

Dienstag, 24. Januar 2023	16.15 Uhr	Hörsaal 2D5

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Orbital engineering of atomic monolayers as quantum spin Hall insulators

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Abstract

Two-dimensional topological insulators (2D-TIs) are characterized by hosting spin-polarized conducting band states at their one-dimensional (1D) edges, giving rise to the quantum spin Hall (QSH) effect. As pointed out in the seminal work of Kane and Mele, the honeycomb lattice of graphene would constitute the most simple realization of a QSH insulator if it were not for its almost negligible spin-orbit interaction. It has been suggested that going to heavier group IV monolayers (such as the Sn-derived "stanene") could remedy this problem, but a convincing demonstration of such 2D TIs is still lacking. Recently we discovered that the neighboring groups III and V in the Periodic Table provide promising alternatives. Here I will discuss rational design, epitaxial synthesis, as well as ARPES and STM studies of two such synthetic QSH insulators, namely Bi (bismuthene) [1-5] and In (indenene) [6] monolayers grown on SiC(0001) substrates.

[1] Science 357, 287 (2017)
[2] Phys. Rev. B 98, 165146 (2018)
[3] Nat. Phys. 16, 47 (2020)
[4] Nat. Commun. 13, 3480 (2022)
[5] Nano Lett., 22, 5420 (2022)
[6] Nat. Commun. 12, 5936 (2021)