About the ferromagnetic topological crystalline insulator $Sn_{1-x}Mn_xTe$ and the correlated antiferromagnetic semiconductor MnTe

A. Bonanni[1]

[1] *Institut für Halbleiter-und-Festkörperphysik, Johannes Kepler University, Altenbergerstrasse 69, A-4040 Linz, Austria*

An interplay of conservation and breaking of local and global symmetries in topological phases of matter leads to the emergence of topological phenomena including quantum anomalous (QAH) Hall effect, topological superconductivity, and non-Abelian quantum statistics. Magnetically doped topological crystalline insulators (TCI) were foreseen to host topologically protected QAH states generating multiple dissipationless edge and surface conduction channels with Chern number $C \geq 1$. The symmetry protected topological phase of the SnTe class of TCI, is characterized by a mirror symmetry resulting in topological surface states. Theoretical and experimental studies demonstrated that four Dirac points are located at the time-reversed-invariant-momentum (TRIM) points for the (111) surface of the SnTe compounds. We provide an overview on how we have proven the opening of the gaps at the TRIMs in ferromagnetic $Sn_{1-x}Mn_xTe$ (111) thin epitaxial layers grown on BaF_2(111). The emergence of hysteretic magnetoconductance and anomalous Hall effect point at the onset of a hole mediated ferromagnetic ordering and the anomalous Hall angle is found to be one of the highest recorded for magnetic topological quantum materials [1].
Moreover, we summarize our recent findings on coherent ultra-fast spin dynamics and coupling between magnetism and optical properties in antiferromagnetic epitaxial MnTe [2,3].

References:

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[2] D. Bossini *et al.*, New J. Phys. **22**, 083029 (2020).
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