Topological Materials: Monopoles, Surface States and More

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Abstract

The classification and discovery of topological materials have attracted intensive research attention in the past decade. After explaining basic concepts of the topological states, I will introduce our most recent progress on novel topological states discovered in a well-known family of materials, transition metal dichalcogenides. Beyond surface states, the topology also brings exotic transport phenomena, such as a nonlinear version of the Hall effect (verified by recent experiments), but without breaking the time-reversal symmetry.

References

[1] Sun, Y., S.-C. Wu, M. N. Ali, C. Felser, and B. Yan. *Prediction of Weyl semimetal in orthorhombic* $MoTe_2$, Phys. Rev. B 92(16), 161107 (R) (2015).

[2] J. Jiang et al. *Signature of type-II Weyl semimetal phase in* $MoTe_2$, Nat. Commun. 8, 13973 (2017).

[3] Y. Zhang, Y. Sun, and B. Yan, *Berry curvature dipole in Weyl semimetal materials: An ab initio study*, Phys. Rev. B 97, 041101 (R) (2018).

[4] Y. Zhang, et al. *Electrically tuneable nonlinear anomalous Hall effect in two-dimensional transition-metal dichalcogenides WTe2 and MoTe2*, 2D Mater. 5, 044001 (2018).

[5] Z. Wang, et al. *Higher-Order Topology, Monopole Nodal Lines, and the Origin of Large Fermi Arcs in Transition Metal Dichalcogenides XTe2 (X= Mo, W).* arXiv:1806.11116 (2018).