PCSI

Room Ballroom South - Session PCSI-TuE

Quantum Materials?

Moderator: Debdeep Jena, Cornell University

7:00pm **PCSI-TuE-1 Magnetic Weyl Semimetals!**, ***Claudia Felser***, *J Gooth, K Manna, E Lui, Y Sun,* Max Planck Institute, Germany **INVITED**

Topology a mathematical concept became recently a hot topic in condensed matter physics and materials science. One important criteria for the identification of the topological material is in the language of chemistry the inert pair effect of the s-electrons in heavy elements and the symmetry of the crystal structure [1]. Beside of Weyl and Dirac new fermions can be identified compounds via linear and quadratic 3-, 6- and 8- band crossings stabilized by space group symmetries [2]. Binary phoshides are the ideal material class for a systematic study of Dirac and Weyl physics. Weyl points, a new class of topological phases was also predicted in NbP, NbAs. TaP, MoP and WP2. [3-7]. In magnetic materials the Berry curvature and the classical AHE helps to identify interesting candidates. Magnetic Heusler compounds were already identified as Weyl semimetals such as Co_2YZ [8-10], in Mn_3Sn [11,12] and $Co_3Sn_2S_2$ [13].

The Anomalous Hall angle helps to identify even materials in which a QAHE should be possible in thin films. Besides this k-space Berry curvature, Heusler compounds with non-collinear magnetic structures also possess real-space topological states in the form of magnetic antiskyrmions, which have not yet been observed in other materials [14].

[1] Bradlyn et al., Nature 547 298, (2017) arXiv:1703.02050

[2] Bradlyn, et al., Science 353, aaf5037A (2016).

[3] Shekhar, et al., Nature Physics 11, 645 (2015)

[4] Liu, et al., Nature Materials 15, 27 (2016)

[5] Yang, et al., Nature Physics 11, 728 (2015)

[6] Shekhar, et al. preprint arXiv:1703.03736

[7] Kumar, et al., Nature Com. , preprint arXiv:1703.04527

[8] Kübler and Felser, Europhys. Lett. 114, 47005 (2016)

[9] Chang et al., Scientific Reports 6, 38839 (2016)

[10] Kübler and Felser, EPL 108 (2014) 67001 (2014)

[11] Nayak, et al., Science Advances 2 e1501870 (2016)

[12] Nakatsuji, Kiyohara and Higo, Nature 527 212 (2015)

[13] Liu, et al. preprint arXiv:1712.06722

[14] Nayak, et al., Nature 548, 561 (2017)

7:30pm **PCSI-TuE-7 Status of Purity for Bulk Samples and Implications for Quantum States**, ***Arthur Ramirez***, University of California Santa Cruz **INVITED**

Present interest in topological materials, some with quantum entangled ground states, is driven in part by a proliferation of new bulk compounds. These materials include structures that lack inversion or time-reversal symmetry, leading to Weyl semimetal (WSM) behavior, and triangular or honeycomb systems capable of supporting a quantum spin liquid (QSL) states. The realization of either undoped WSM or fully entangled QSL phases will likely require levels of crystallinity far beyond that realized in present samples. I will sketch out a few examples in both classes of systems and discuss approaches to achieve high purity bulk material.

8:00pm **PCSI-TuE-13 Rump Session**,

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