Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Topological transport in Weyl semimetal

Banasree Sadhukhan

KTH, Sweden

The band theory of solids was revolutionised by the discovery of topology in modern condensed matter and materials science. Topological materials have inverted band structure and non-trivial surface states protected by some symmetries. Starting by identifying a new class of Weyl semimetals (WSMs) in rare earth carbides family (RMC_2 where R is a rare-earth metal and M is a transition metal), we stabilised an odd number of Weyl points (WPs) at the Fermi energy [1]. The dynamical movement of WPs in energy and momentum is controlled by a combination of inversion and time reversal symmetry breaking. Canting the magnetisation away from principle directions reduces the symmetry and splits the WPs in energy. This produces a chirality imbalance and enhances planar Hall Effect which is mediated by chiral anomaly [2]. Additionally, topological semimetals without mirror and inversion symmetries possess the structural chirality which lifts the degeneracy of the pair of topological charge with opposite sign. Identifying $SrSi_2$ as a chiral double WSMs, we study the electronic structure and nonlinear optical response. We reported the quantised circular photogalvanic response in $SrSi_2$ [3].

References :

[1] "Tunable chirality of noncentrosymmetric magnetic Weyl semimetals", Rajyavardhan Ray, **Banasree Sadhukhan**, Manuel Richter, Jorge I. Facio, Jeroen van den Brink, npj Quantum Materials **7 (1)**, 19 (2022).
[2] "Effect of chirality imbalance on Hall transport of PrRhC2", **Banasree Sadhukhan**, Tanay Nag, arXiv:2203.12756 (2022).
[3] "Electronic structure and unconventional nonlinear response in double weyl semimetal SrSi2", **Banasree Sadhukhan**, Tanay Nag, Phys. Rev. B **104**, 245122 (2021).

Tuesday, Feb 7th 2023

04:00 PM (Tea / Coffee 03.45 PM)

Auditorium, TIFR-H