Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Seminar

Discovery of topological magnet and chiral Fermions: Synthesis to Applications

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The interplay between topology and various symmetry-breaking phases of matter has emerged as a key frontier in solid-state physics. This provides a fertile platform to realize the elusive concepts from particle physics in a condensed matter system. Their topologically protected unusual electronic behavior carries immense interest for future dissipationless spintronics to other applications. Here I shall discuss our discovery of a room temperature topological magnet (Co_2MnGa), with a topological transport-bulk-surface correspondence. The anomalous Hall conductivity attains a colossal value of ~ 1600 Ω The interplay between topology and various symmetry-breaking phases of matter has emerged as a key frontier in solid-state physics. This provides a fertile platform to realize the elusive concepts from particle physics in a condensed matter system. Their topologically protected unusual electronic behavior carries immense interest for future dissipationless spintronics to other applications. Here I shall discuss our discovery of a room temperature topological magnet (Co2MnGa), with a topological transport-bulk-surface correspondence. The anomalous Hall conductivity attains a colossal value of ~1600 $\Omega^{-1}cm^{-1}$ at 2 K for Co_2MnGa. Even at room temperature, we observe the highest anomalous Hall angle upto 12% and largest anomalous Nernst thermopower of ~6.0 $\mu V K^{-1}$, which is approximately 7 times larger than any material ever reported in literature. Then with experimental proof, I demonstrate how one can tune the anomalous Hall conductivity in topological magnetic Heusler compounds, via the symmetry engineering, from a colossal value of ~2000 $\Omega^{-1}cm^{-1}$ to zero without disturbing sample's magnetization. In the second section, I shall discuss our recent discovery of topological chiral crystals. This novel phase of matter carries many intrinsic ideal and near-ideal properties that emerge as a direct consequence of the structural chirality of the crystals. For the first time, we have observed room temperature quantized circular photogalvanic response in a candidate chiral crystal RhSi, which arose significant enthusiasm in the topological community.

Tuesday, May 28th 2019

4:00 PM (Tea/Coffee at 3:30 PM)

Seminar Hall, TIFR-H