VIDEO ARTICLE

Vid. Proc. Adv. Mater., Volume 2, Article ID 2103150 **(2021)**

Magnetic Weyl semimetal in $Co_3Sn_2S_2$

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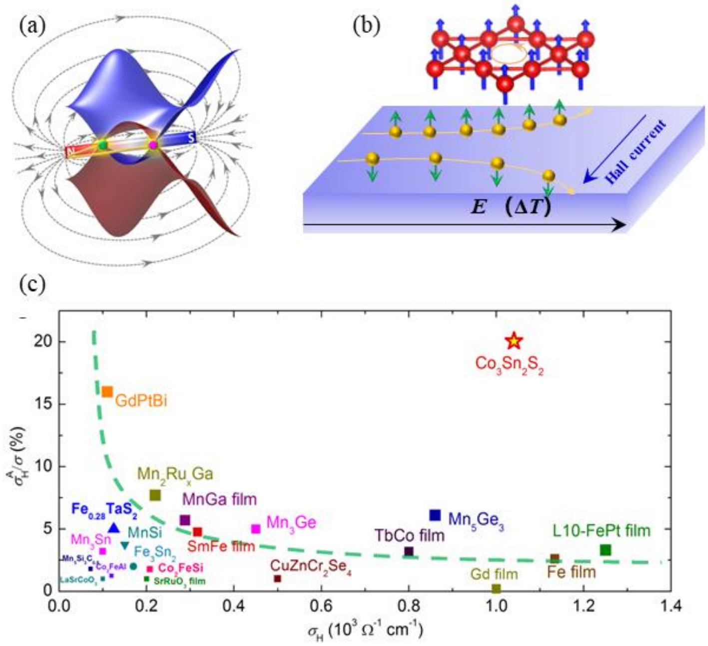
DOI: 10.5185/vpoam.2021.03150

Graphical Abstract



Giant anomalous Hall effect in magnetic Weyl semimetal $Co_3Sn_2S_2$

Abstract

I would like to talk about a compound of $Co_3Sn_2S_2$, which is believed to be the first experimentally confirmed magnetic Weyl semimetal (WSM). The existence of Weyl points requires lifting the spin degeneracy of the electronic band structure by breaking the inversion or time-reversal symmetry (or both). In last years, many Weyl semimetals (WSMs) with broken inversion symmetry have been theoretically predicted, and some of them have been experimentally verified. But the magnetic WSM is still awaiting in experiments, though there are some theoretical predictions. In this work we proposed the magnetic WSM in $Co_3Sn_2S_2$ with kagome-lattice, and experimentally verified by both ARPES and STM. Owing to the Weyl points and mirror symmetry protected nodal line band structure, $Co_3Sn_2S_2$ hosts giant linear responses of anomalous Hall and anomalous Nernst effects in transport.

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The anomalous Hall conductivity and the anomalous Hall angle simultaneously reach 1,130 S/cm and 20%, respectively, an order of magnitude larger than typical magnetic systems. Combining the kagome-lattice structure and the long-range out of plane ferromagnetic order of $Co_3Sn_2S_2$, we expect that this material is an excellent candidate for observation of the quantum anomalous Hall state in the two-dimensional limit.

Keywords: Magnetic Weyl semimetal, Anomalous Hall effect, Anomalous Nernst effect.

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Biography of Presenting Author

Yan Sun is a junior research group leader in Max Planck Institute for Chemical Physics of Solids. His research interest mainly focusses on the predicting and understanding the physical properties (including transport, surface states and other topological properties) of materials based on the electronic structure and electromagnetic response theories. So far, he has published more than 60 research papers with more than 4000 citations.

Citation of Video Article

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