Ultrafast dynamics of magnetic topological materials: $EuIn_2As_2$ and EuAgAs

(Section 3, Oral)

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Magnetic topological materials offer a fascinating platform for exploring the interplay between magnetism and topology, leading to novel functionalities. Here, we utilize ultrafast optical spectroscopy to probe the real-time dynamics of topological states in two promising MTMs: $EuIn_2As_2$ and EuAgAs.

$EuIn_2As_2$, a candidate for a magnetic topological-crystalline axion insulator, exhibits a narrow surface magnetic gap ($2\Delta_0 \approx 8.2$ meV) emerging at its antiferromagnetic transition temperature ($T_N \approx 16$ K). Additionally, below T_N, two low-energy collective modes (ω_1 and ω_2) with strong temperature dependence are observed at frequencies of ~9.9 GHz and 21.6 GHz ($T = 4$ K), respectively. These observations suggest rich magnetic dynamics and support $EuIn_2As_2$'s potential for realizing a magnetic topological-crystalline axion insulator.

EuAgAs, classified as a magnetic topological semimetal, displays a photoinduced transient magnetic phase transition upon ultrafast optical excitation. This finding highlights the unique light-matter interaction in EuAgAs and opens avenues for exploring novel functionalities in this material class.

In conclusion, our studies on $EuIn_2As_2$ and EuAgAs demonstrate the power of ultrafast spectroscopy in unraveling the intricate dynamics of Magnetic topological materials. These findings not only provide deeper insights into the interplay between magnetism and topology but also pave the way for the development of novel Magnetic topological materials based devices with tailored functionalities.

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