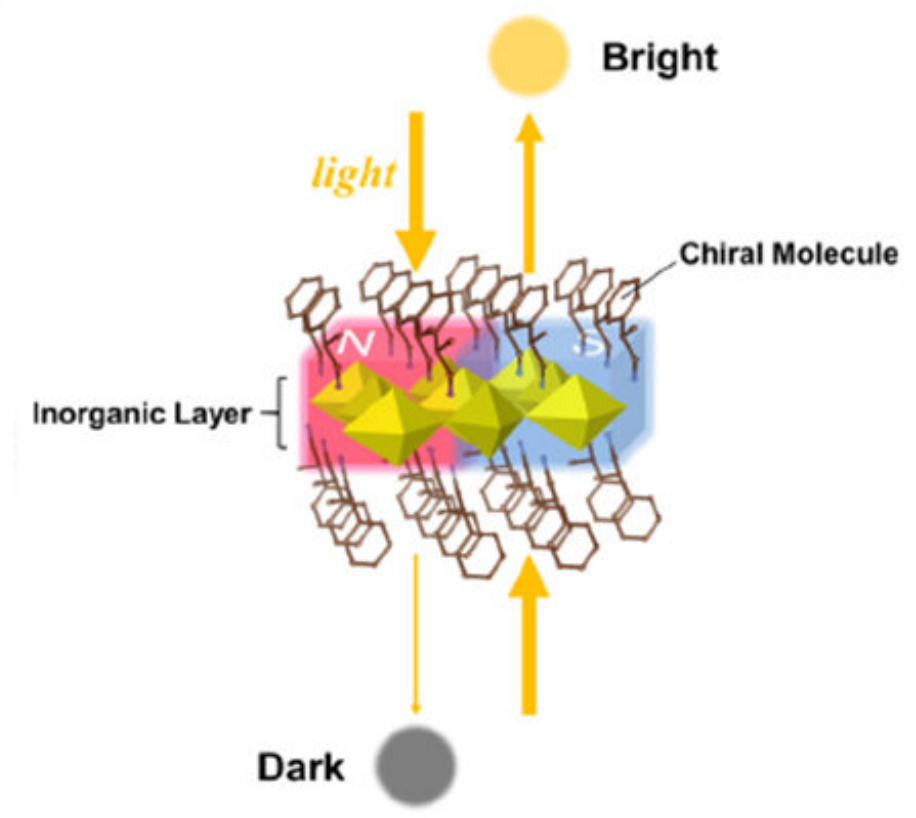
Novel magnet design with mirror-like properties

June 11 2021



The Magic mirror-like magnet. The brightness of the transmitted light from the magnet changes depending on whether the material is viewed from the front or the back. Credit: Kouji Taniguchi

Researchers at Tohoku University have demonstrated the designability

of novel magnets with magic mirror-like characteristics in organic-inorganic hybrid perovskite (OIHP)-type compounds.

OIHP-type compounds, a type of material used to construct solar cells, possess exceptional optical properties and have recently attracted worldwide interest. Researchers are keen to harness their structural diversity.

Although the superior optical properties of OIHPs have been mainly studied for their photoelectric characteristics, several OIHP-type compounds are known to function as magnets that transmit light. Combining the excellent optical characteristics with magnetism, OIHP-type compounds are a promising platform for designing functional magneto-optical materials.

A multi-institutional Japanese team, led by Kouji Taniguchi of Tohoku University's Institute for Materials Research, developed a new magnet, in which brightness changes are determined by whether the material is viewed from the front or the back.

Taking advantage of OIHP-type compounds, they have designed low symmetry magnets, where magic mirror characteristics are expected, by introducing chiral organic molecules into layered crystal structure of inorganic magnets.

In addition, they found that the front and back of matter can be switched by a low magnetic field, which is obtainable by a ubiquitous permanent magnet.

"We hope the development of new magneto-optical materials based on the material design concept presented in this study will lead to the applications in spin photonic devices," said Taniguchi.

More information: Kouji Taniguchi et al, Magneto-Electric Directional Anisotropy in Polar Soft Ferromagnets of Two-Dimensional Organic–Inorganic Hybrid Perovskites, *Angewandte Chemie International Edition* (2021). DOI: 10.1002/anie.202103121

Provided by Tohoku University