Scientists describe a novel way to manipulate exotic materials

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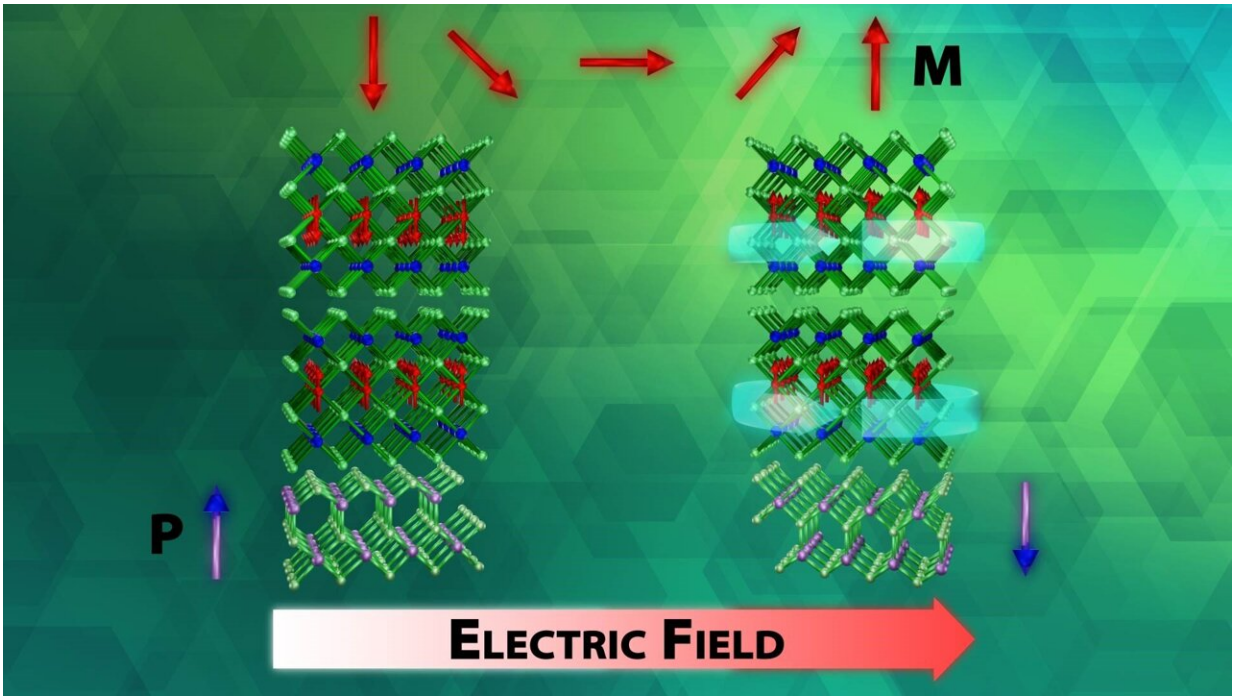

A new method to control quantum states in a material is shown. The electric field induces polarization switching of the ferroelectric substrate, resulting in different magnetic and topological states. Credit: Mina Yoon, Fernando Reboredo, Jacquelyn DeMink/ORNL, U.S. Dept. of Energy

An advance in a topological insulator material—whose interior behaves like an electrical insulator but whose surface behaves like a conductor—could revolutionize the fields of next-generation electronics

and quantum computing, according to scientists at Oak Ridge National Laboratory.

Discovered in the 1980s, a topological material is a new phase of material whose discoverers received a Nobel Prize in 2016. Using only an electric field, ORNL researchers have transformed a normal insulator into a magnetic topological insulator. This exotic material allows electricity to flow across its surface and edges with no energy dissipation. The electric field induces a change in the state of matter.

The ORNL scientists have published their findings in *2D Materials*.

"The research could result in many practical applications, such as next-generation electronics, spintronics and quantum computing," said ORNL's Mina Yoon, who led the study.

Such matter could lead to high-speed, low-power electronics that burn less energy and operate faster than current silicon-based electronics.

More information: Wei Luo et al, Non-volatile electric control of magnetic and topological properties of MnBi2Te4 thin films *, *2D Materials* (2023). DOI: 10.1088/2053-1583/accaf7

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