Physicists predict behavior of rare materials at near-room temperature

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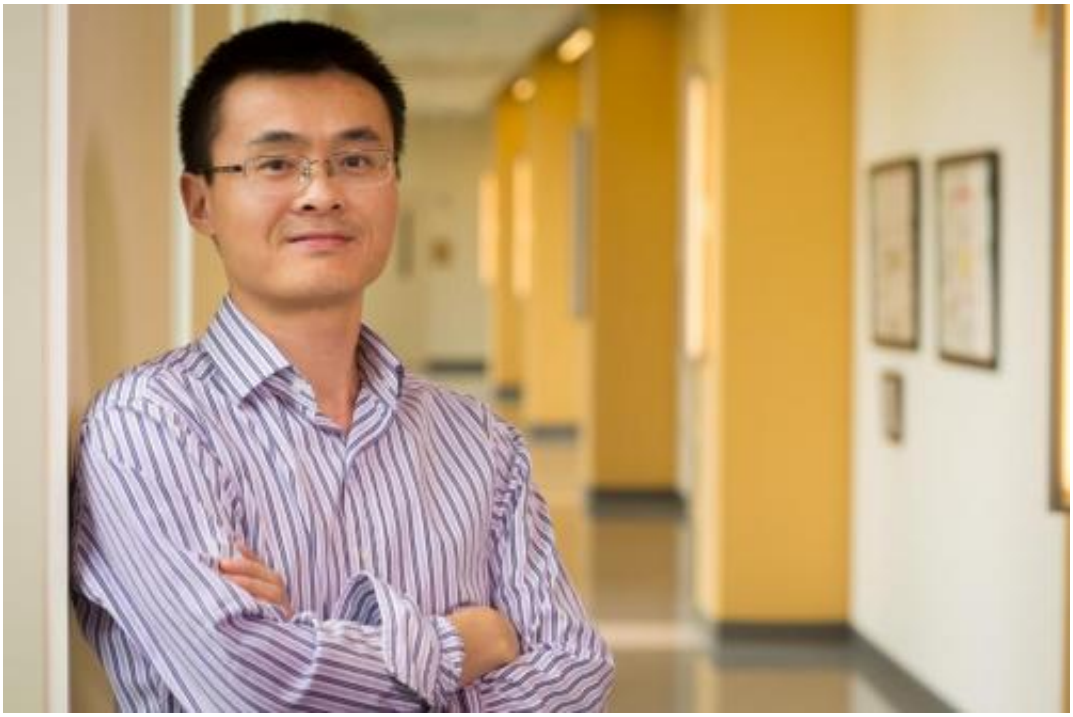

Yurong Yang, research assistant professor, University of Arkansas. Credit: Russell Cothren, University of Arkansas

(Phys.org) —New theoretical physics research reveals rare materials that possess both controllable magnetic and electric polarization properties at near-room temperatures.

The discovery could lead to longer battery life and increased memory

storage for electronic devices, said Yurong Yang, a research assistant professor at the University of Arkansas.

An international team of physicists published its findings on May 28 in *Nature Communications, an online journal published by the journal Nature, in a paper titled "Near room-temperature multiferroic materials with tunable ferromagnetic and electrical properties."*

A rare class of materials known as multiferroics can change their electrical polarization when under a magnetic field or magnetic properties when under an electric field. But multiferroics usually exhibit these properties at temperatures far below room temperature, which makes them useless for every-day applications.

As a result, the materials used to power today's memory devices do so through electricity or magnetism, but not both.

The research team included Yang and Laurent Bellaiche, Distinguished Professor of physics at the University of Arkansas. Yang, a theoretical physicist, used computer modeling to perform extremely accurate calculations on a specific class of materials to find combinations that would display these properties.

The researchers found that a specific class of multiferroics, when periodically alternating along a specific direction to make what is called a superlattice, should exhibit both controllable magnetic and electrical polarization properties at near-room temperature, Yang said.

Superlattices are like multi-layered cakes, where the cake layers are only nanometers thick and are made of different materials such as the multiferroics studied in this paper. The next step will be experimental confirmation of their calculations.

More information: "Near room-temperature multiferroic materials with tunable ferromagnetic and electrical properties." Hong Jian Zhao, et al. *Nature Communications* 5, Article number: 4021 DOI: 10.1038/ncomms5021. Received 28 January 2014 Accepted 30 April 2014 Published 28 May 2014

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