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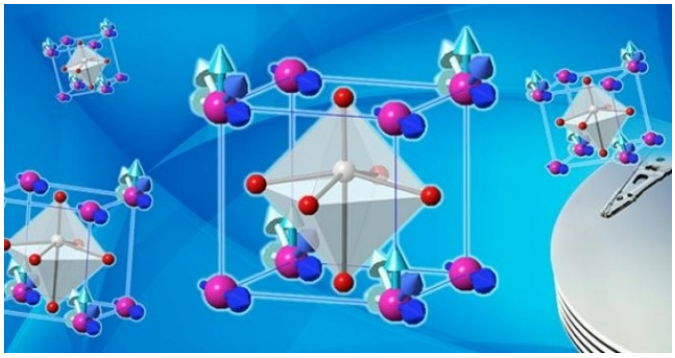
Physicists at the US Department of Energy's Argonne National Laboratory may have found the materials making the next generation of memory-- "magnetoelectrics" with linked magnetic and electric properties.



Magnetoelectric materials allow one to control magnetic behaviours via the application of electrical current, or vice versa. As physicist Philip Ryan puts it "electricity and magnetism are intrinsically coupled-– they’re the same entity. Our research is designed to accentuate the coupling between the electric and magnetic parameters by subtly altering the structure of the material."

The team at Argonne uses EuTiO3 (europium-titanium oxide), a compound whose atomic structure has a titanium atom inside an atomic "cage" of europium and oxygen (see picture). Compressing the cage (via thin EuTiO3 film) and applying voltage shifts the titanium, electrically polarising the compound and essentially changing the magnetic order of the material.

The result proves the link between the electrical (titanium) and magnetic (europium) components of the compound, at least according to the scientists.

Magnetoelectrics are of interest to memory makers-- such materials potentially combine the fast write speeds of electric memory with the robustness of magnetic memory. Such materials might also lead to the creation of non-binary memories, bringing about a new world of computer logic using broader values than just '0' and '1.'

"The more we learn about magnetoelectrics, the more we open up this space that gives us the best of both worlds," Ryan says.

As one might expect, magnetoelectrics are still a long way from appearing in consumer devices-- but such results establish the required groundwork for such applications.

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