How magnetization direction can be controlled using strain in an interfacial multiferroic material

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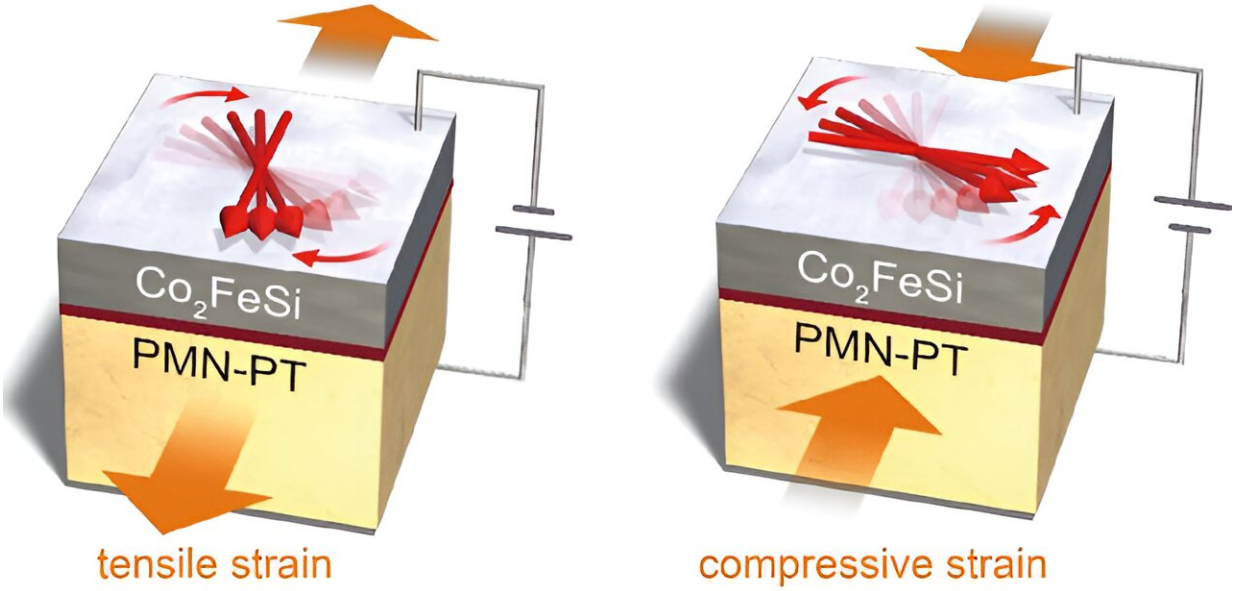

Interfacial multiferroic structure and control of magnetization orientation. Credit: *NPG Asia Materials* (2024). DOI: 10.1038/s41427-023-00524-6

Controlling the direction of magnetization using low electric field is necessary for developing efficient spintronic devices. In spintronics, properties of an electron's spin or magnetic moment are used to store information. The electron spins can be manipulated by straining orbital magnetic moments to create a high-performance magnetoelectric effect.

A Japanese research team, led by Jun Okabayashi from the University of Tokyo, including Associate Professor Yoshihiro Gohda from Tokyo Tech and Osaka University researchers have revealed a strain-induced orbital control mechanism in interfacial multiferroics. The study is published in the journal *NPG Asia Materials*.

In multiferroic material, the magnetic field can be controlled using an electric field—potentially leading to efficient spintronic devices. The interfacial multiferroics that Okabayashi and his colleagues studied consist of a junction between a ferromagnetic material and a piezoelectric material. The direction of magnetization in the material could be controlled by applying voltage.

The team showed the microscopic origin of the large magnetoelectric effect in the material. The strain generated from the piezoelectric material could change the orbital magnetic moment of the ferromagnetic material. They revealed element-specific orbital control in the interfacial multiferroic material using reversible strain and provided guidelines for designing materials with a large magnetoelectric effect. The findings will be useful in developing new information writing technology that consumes less power.

More information: Jun Okabayashi et al, Strain-induced specific orbital control in a Heusler alloy-based interfacial multiferroics, *NPG Asia Materials* (2024). DOI: 10.1038/s41427-023-00524-6

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