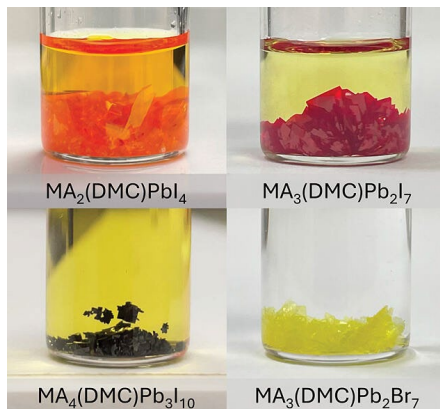


December 2024

Translated from Japanese

**New semiconductor material that changes colour when heated or cooled developed by Nanyang Technological University, Singapore**

Nanyang Technological University (NTU) in Singapore announced on November 22 that NTU researchers have created a new semiconductor material that changes colour when heated or cooled. The research results were published in the academic journal *Journal of the American Chemical Society* and NTU's research and innovation journal *Pushing Frontiers*.

**NTU's new perovskite**

The researchers developed a semiconductor material known as a two-dimensional halide perovskite, which has uses in devices such as solar cells and light-emitting diodes. NTU researcher Ayan Zhumekenov, lead author of the paper, created the new perovskite by mixing methylammonium-based perovskite crystals with dimethyl carbonate, a non-toxic solvent.

The researchers discovered that by adjusting the ratio of methylammonium and dimethylcarbonate in the crystal structure, they could tune the band gap of the crystal structure. The band gap, which refers to the amount of energy required for electrons to break out of a bond and become conductive, also determines the colour of the material. The ability to engineer the width of this band gap is important for perovskites' applications. The new two-dimensional halide perovskites exhibit switchable behaviour.

The researchers discovered that one of the perovskites can be switched between two color states: from orange to red when the crystal is heated to 80°C, and back to orange when cooled to room temperature. They also demonstrated that this colour change reaction can be repeated for 25 cycles. Thermochromic switching, in which a material's

colour changes reversibly with a change in temperature, could be used in smart coatings or heat-sensitive inks that change colour at different temperatures. The researchers hope that this innovation could pave the way for technological applications, including optoelectronics, a field in which electrons and light are combined.

[https://spap.jst.go.jp/asean/news/241204/topic\\_na\\_02.html](https://spap.jst.go.jp/asean/news/241204/topic_na_02.html)