# Silver and gold nanowires open the way to better electrochromic devices

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The team of Professor Dongling Ma of the Institut national de la recherche scientifique (INRS) developed a new approach for foldable and solid devices.

Solid and flexible electrochromic (EC) devices, such as smart windows, wearable electronics, foldable displays, and smartphones, are of great interest in research. This importance is due to their unique property: the color or opacity of the material changes when a voltage is applied.

Traditionally, electrochromic devices use indium tin oxide (ITO) electrodes. However, the inflexibility of metal oxide and the leakage issue of liquid electrolyte affect the performance and lifetime of EC devices. ITO is also brittle, which is incompatible with flexible substrates.

Furthermore, there are concerns about the scarcity and cost of indium, a rare element, which raises a question on its long-term sustainability. The fabrication process for the highest quality ITO electrodes is expensive. "With all these limitations, the need for ITO-free optoelectronic devices are considerably high. We were able to achieve such a goal," says Dongling Ma who led the study recently published in the journal *Advanced Functional Materials.*

## A new approach

Indeed, the team has developed a new approach with a cost-effective and easy electrode fabrication that is completely ITO-free. "We reached high stability and flexibility of transparent conductive electrodes (TEC), even in a harsh environment, such as oxidizing solution of H2O2" she adds. They are the first to apply stable nanowires-based TCEs in flexible EC devices, using silver nanowires coated with a compact gold shell.

Now that they have a proof of concept, the researchers want to scale up the synthesis of TEC and make the nanowires fabrication process even more cost-effective, while maintaining high device performance.

**More information:** Shengyun Huang et al, Highly Stable Ag–Au Core–Shell Nanowire Network for ITO-Free Flexible Organic Electrochromic Device, *Advanced Functional Materials* (2021). DOI: 10.1002/adfm.202010022

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