UCLA engineers create new transparent electrodes for highly flexible electronics

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The development of new electronic applications like thin-film solar panels, wearable displays and non-invasive biomedical devices, which require significant deformation to copy body movements, has heightened the need for transparent, highly flexible electrodes.

Currently, indium-doped tin oxide (ITO) technology is used for electrodes in LCD displays, solar cells, iPad and smart-phone touch screens, and organic light-emitting diode (OLED) displays for televisions and computer monitors. But ITO can be fragile and toxic, and it is becoming increasingly more expensive to produce.

Researchers at the UCLA Henry Samueli School of Engineering and Applied Science have now developed a new transparent electrode based on silver nanowires (AgNW) that could replace ITO. The new electrode uses low-cost, non-toxic and stable materials and is easy to fabricate. It is produced on a cross-linked, transparent polyacylate substrate, which is cheaper than glass and can be stiff and rigid or flexible and stretchable.

The resulting AgNW/polymer electrodes have high transparency, low sheet resistance comparable to ITO, and low surface roughness. They are substantially more compliant than ITO and would be suitable for the fabrication of high-performance and stretchable OLEDs and solar cells.

The shape-memory property of the polymer substrate could lead to electronic devices that can be deformed to various stable shapes. The deformation is reversible, causes minimal damage to the devices and can

be repeated for many cycles.

Authors of the research are Zhibin Yu, Qingwu Zhang, Lu Li, Qi Chen, Xiaofan Niu, Jun Liu and Qibing Pei. The invention of the new transparent electrode was led by Qibing Pei, who is a professor of materials science and engineering at UCLA Engineering.

More information: This research was recently published in the peer-reviewed journal *Advanced Materials* and is available online at: onlinelibrary.wiley.com/doi/10 … a.201003398/abstract

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