Invisible, stretchable circuits to shape next-gen tech

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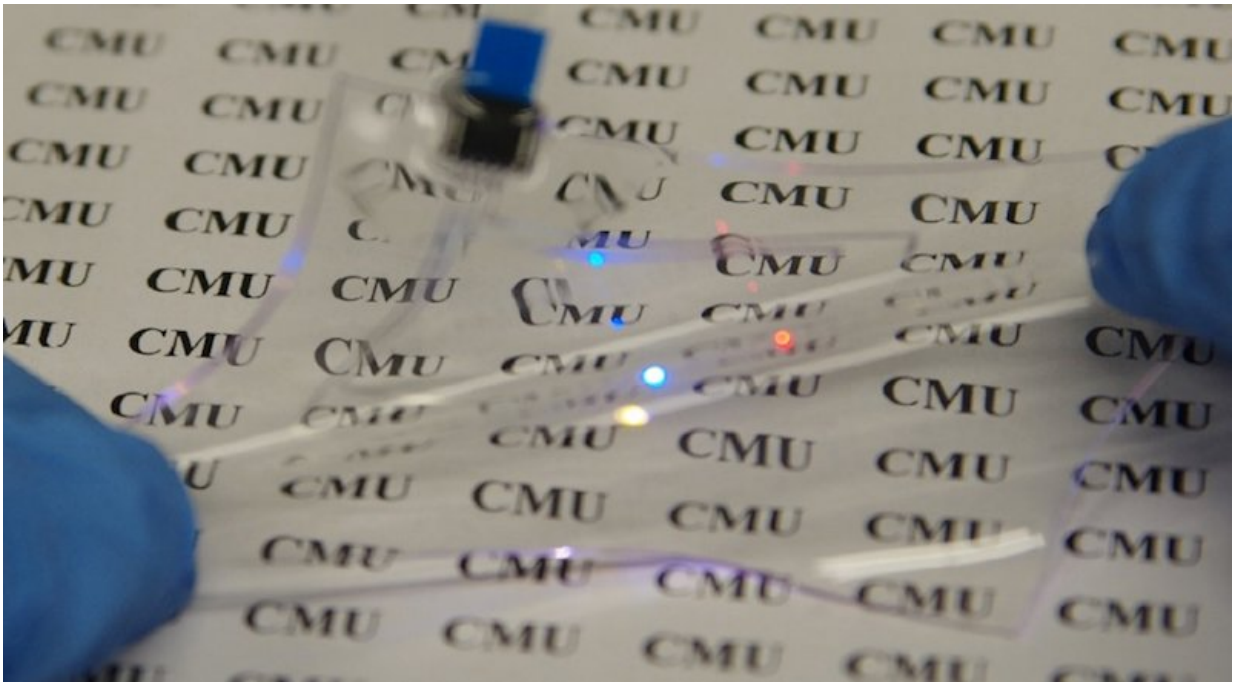

The displays and touchscreens used in next-generation technologies will require transparent conductors that are soft, elastic, and highly stretchable. Credit: Soft Materials Laboratory, Carnegie Mellon University

Electrically conductive films that are optically transparent have a central role in a wide range of electronics applications, from touch screens and video displays to photovoltaics. These conductors function as invisible electrodes for circuit wiring, touch sensing, or electrical charge

collection and are typically composed of transparent conductive oxides. But, they have a weakness.

Most transparent conductors are mechanically stiff. Stretching the inelastic material causes it to break apart and lose electrical functionality. This inability to support strain greatly limits the role of these existing materials for emerging applications in wearable computing, soft bioelectronics, and biologically-inspired robotics. The displays and touchscreens used in these next-generation technologies will require transparent conductors that are soft, elastic, and highly stretchable.

Carnegie Mellon University's Associate Professor of Mechanical Engineering Carmel Majidi and his research team have developed conductive thin-films that have the unique combination of properties needed for these next-generation technologies: high electrical conductivity, visual imperceptibility, low mechanical stiffness, and high elasticity.

Using a laser-based microfabrication technique, the team achieved these properties by coating the surface of a thin rubber film with a fine grid of metal (a eutectic alloy of gallium and indium, EGaIn) that is liquid at room temperature.

The findings were published in *Advanced Materials* in a paper titled "Visually Imperceptible Liquid Metal Circuits for Transparent, Stretchable Electronics with Direct Laser Writing" by Chenfeng Pan, Kitty Kumar, Jianzhao Li, Eric J. Markvicka, Peter R. Herman, Carmel Majidi.

Majidi heads the Integrated Soft Materials Laboratory at Carnegie Mellon University.

More information: "Visually Imperceptible Liquid Metal Circuits for Transparent, Stretchable Electronics with Direct Laser Writing," *Advanced Materials*, DOI: 10.1002/adma.201706937

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