FLEXIBLE ELECTRONICS

Liquid metals take stretchable circuits to new heights

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Soft electronic materials can be used to build wearable devices and robotic parts. One approach to creating such systems is to use conductive inks or liquid metals (usually gallium–indium alloys) to print materials and components into flexible circuits. However, conductive inks can suffer from low conductivities and the use of liquid metals can impose limits on the height of the printed structures (4 mm) because of mechanical stability issues. Matthew Johnston and colleagues at Oregon State University have now developed a printing technique that can produce electrical vias as tall as 10 mm by using a liquid metal paste that is an alloy of gallium, indium and tin, and filled with nickel particles.

The researchers used an off-the-shelf 3D printer, which was adapted so that it could hold a syringe containing the paste,

to print stretchable, two-layer circuits with interconnects. The technique requires each circuit layer to be encapsulated in silicone before building the next, so that multilayer structures can be created. To illustrate the capabilities of the approach, Johnston and colleagues used the printing method to fabricate an LED oscillator circuit that incorporates both active and passive electrical components, and a resistive strain sensor with integrated readout circuitry. The LED oscillator circuit was able to function under stretching, while measurements on the strain sensor showed that the conductivity of the metal paste does not decrease under high strain.

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