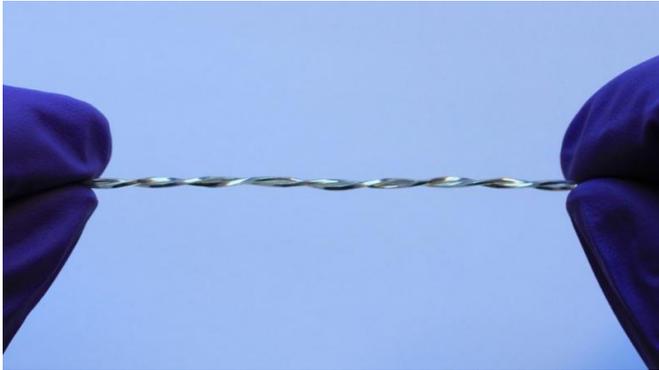


Touch-sensitive, elastic fibers offer new interface for electronics

4 April 2017, by Matt Shipman



Credit: North Carolina State University

Researchers from North Carolina State University have created elastic, touch-sensitive fibers that can interface with electronic devices.

"Touch is a common way to interact with electronics using keyboards and touch screens," says Michael Dickey, a professor of chemical and biomolecular engineering at NC State and corresponding author of a paper describing the work. "We have created soft and stretchable fibers that can detect touch, as well as strain and twisting. These microscopic fibers may be useful for integrating electronics in new places, including wearable devices."

The new fibers are made of tube-like polymer strands that contain a liquid metal alloy, eutectic gallium and indium (EGaIn). The strands are only a few hundred microns in diameter, which is slightly thicker than a human hair.

Each fiber consists of three strands. One is completely filled with EGaIn, one is two-thirds filled with EGaIn, and one is only one-third filled with EGaIn. The slim tubes are then twisted together into a tight spiral.

The touch-responsive fiber works because of [capacitance](#), or the phenomenon in which electric charge is stored between two conductors separated by an insulator. For example, when your finger (which is a conductor) touches the screen of your smartphone (which is an insulator), it changes the capacitance between your finger and the electronic material beneath the screen. The smartphone's technology then interprets that change in capacitance as a command to open an app or to type on the keypad.

Similarly, when your finger touches the elastic fiber, it changes the capacitance between your finger and the EGaIn inside the insulating polymer strands. By moving your finger along the fiber, the capacitance will vary, depending on how many of the strands contain EGaIn at that point in the fiber.

This effectively gives you the ability to send different electronic signals depending on which part of the fiber you [touch](#). A video demonstrating the sensor can be seen below:

The researchers also developed a sensor using two [polymer strands](#), both of which are completely filled with EGaIn.

Again, the strands are twisted into a tight spiral. Increasing the number of twists elongates the elastic strands and brings the EGaIn in the two tubes closer together. This changes the capacitance between the two strands.

"We can tell how many times the fiber has been twisted based on the change in capacitance," Dickey says. "That's valuable for use in torsion sensors, which measure how many times, and how quickly, something revolves. The advantage of our sensor is that it is built from elastic materials and can therefore be twisted 100 times more – two orders of magnitude – than existing torsion [sensors](#)."

More information: Christopher B. Cooper et al.
Stretchable Capacitive Sensors of Torsion, Strain,
and Touch Using Double Helix Liquid Metal Fibers,
Advanced Functional Materials (2017). [DOI:](https://doi.org/10.1002/adfm.201605630)
[10.1002/adfm.201605630](https://doi.org/10.1002/adfm.201605630)

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