Smart supercapacitor fiber with shape memory

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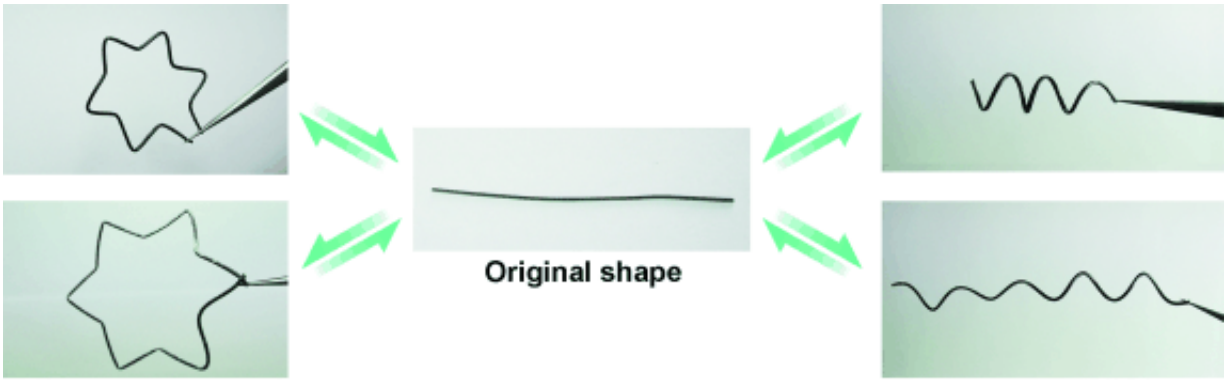

Wearing your mobile phone display on your jacket sleeve or an EKG probe in your sports kit are not off in some distant imagined future. Wearable "electronic textiles" are on the way. In the journal *Angewandte Chemie*, Chinese researchers have now introduced a new type of fiber-shaped supercapacitor for energy-storage textiles. Thanks to their shape memory, these textiles could potentially adapt to different body types: shapes formed by stretching and bending remain "frozen", but can be returned to their original form or reshaped as desired.

Any electronic components designed to be integrated into textiles must be stretchable and bendable. This is also true of the supercapacitors that

are frequently used for data preservation in static storage systems (SRAM). SRAM is a type of storage that holds a small amount of data that is rapidly retrievable. It is often used for caches in processors or local storage on chips in devices whose data must be stored for long periods without a constant power supply. Some time ago, a team headed by Huisheng Peng at Fudan University developed stretchable, pliable fiber-shaped supercapacitors for integration into electronic textiles. Peng and his co-workers have now made further progress: supercapacitor fibers with shape memory.

The fibers are made using a core of polyurethane fiber with shape memory. This fiber is wrapped with a thin layer of parallel carbon nanotubes like a sheet of paper. This is followed by a coating of electrolyte gel, a second sheet of carbon nanotubes, and a final layer of electrolyte gel. The two layers of carbon nanotubes act as electrodes for the supercapacitor. Above a certain temperature, the fibers produced in this process can be bent as desired and stretched to twice their original length. The new shape can be "frozen" by cooling. Reheating allows the fibers to return to their original shape and size, after which they can be reshaped again. The electrochemical performance is fully maintained through all shape changes.

Weaving the fibers into tissues results in "smart" textiles that could be tailored to fit the bodies of different people. This could be used to make precisely fitted but reusable electronic monitoring systems for patients in hospitals, for example. The perfect fit should render them both more comfortable and more reliable.

More information: Jue Deng et al. A Shape-Memory Supercapacitor Fiber, *Angewandte Chemie International Edition* (2015). DOI: 10.1002/anie.201508293