E-textiles get fashion upgrade with memory-storing fiber

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The integration of electronics into textiles is a burgeoning field of research that may soon enable smart fabrics and wearable electronics. Bringing this technology one step closer to fruition, Jin-Woo Han and Meyya Meyyappan at the Center for Nanotechnology at NASA Ames Research Center in Moffett Field, Calif., have developed a new flexible memory fabric woven together from interlocking strands of copper and copper-oxide wires. At each juncture, or stitch along the fabric, a nanoscale dab of platinum is placed between the fibers. This "sandwich structure" at each crossing forms a resistive memory circuit. Resistive memory has received much attention due to the simplicity of its design.

As described in the AIP's journal *AIP Advances*, the copper-oxide fibers serve as the storage medium because they are able to change from an insulator to a conductor simply by applying a voltage. The copper wires and the platinum layers serve as the bottom and top electrodes, respectively. This design easily lends itself to textiles because it naturally forms a crossbar memory structure where the fibers intersect. The researchers developed a reversible, rewritable memory system that was able to retain information for more than 100 days.

In this proof-of-concept design, the copper wires were one millimeter thick, though smaller diameter wire would allow for an increase in memory density and a reduction in weight. In practical applications, e-textiles would need to integrate a battery or power generator, sensors, and a computational element, as well as a memory structure. Taken together, an e-textile could potentially detect biomarkers for various

diseases, monitor vital signs of the elderly or individuals in hostile environments, and then transmit that information to doctors.

More information: "Copper oxide resistive switching memory for e-textile" is published in *AIP Advances*.

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