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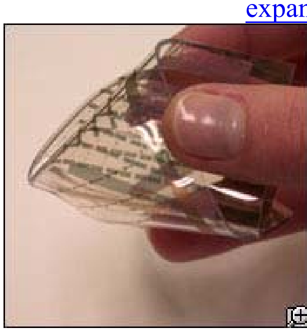

Stretchable Electronics

Electronics Stretch Out

By Tracy Staedter, Discovery News

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Dec. 27, 2005— Electronic wires and circuits that stretch like rubber bands and accordions could lead to sensor-embedded covers for aircraft and robots, and even prosthetic skin for humans.

Flexible electronics are typically characterized by conducting plastic-based liquids that can be printed onto thin, bendable surfaces — think electronic ink on flexible displays.

Stretchable electronics work like elastic to expand and contract.

"You can deform the electronic surface over any kind of shape, like a sphere , a ball or your elbow," said Stephanie Lacour, an electrical engineer at Princeton University, whose team is among a handful of researchers working on the technology.

Lacour and her colleagues presented their invention recently at the IEEE International Electron Devices Meetings in Washington, D.C.

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In Lacour's approach, tiny, thin film transistors fabricated onto stiff platforms that sit on silicone rubber are linked together by bridges of stretchy conducting material.

The bridges, called interconnects, are made from a rubbery material coated in gold stripes, which can carry a charge.

The result will eventually be a kind of net made of the gold-coated rubbery material with a transistor or a simple circuit located where the threads intersect.

The transistors won't stretch, but because they are tiny and floating like islands on a stretchable matrix, the overall device will be able to stretch and relax, accommodating any surface shape, and still function electrically.

In experiments, Lacour demonstrated that the elastic interconnects could be pulled to twice their length, or stretched radially to 15 percent of their original size.

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Picture: Courtesy of Stephanie Lacour |
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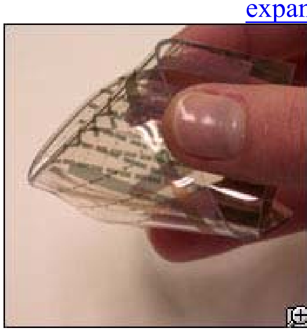

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That kind of give is more than enough to design a prosthetic skin, which would need to stretch to about 10 percent around a person's elbow, said Lacour.

"With any kind of wearable electronic, I think it's a much nicer form factor if it can stretch and form with the motions of your body in a natural way," said John Rogers of the University of Illinois at Urbana-Champaign.

Rogers' team is also working on stretchable electronics, but from a different angle. His team fabricated thin ribbons of silicon and designed them to bend like an accordion.

Then they attached the silicon ribbons to a pre-stretched rubbery base. When the base was allowed to relax, the ribbons folded up like an accordion.

The team, who published their results in a recent issue of the journal *Science*, was able to stretch the silicon to nearly 30 percent of its original length without damaging its conducting properties.

May We Suggest

Such electronics would work well integrated into the covering of an aircraft to provide real-time measurement of air flow, for example, or could make up the sensory skin of a robot, said Rogers.

Both Rogers and Lacour are working to improve the durability of their stretchable electronics and think that devices that incorporate one or the other technology, or maybe even both, could be on the market within the next three to five years.

"In the end, some of these approaches may be complimentary," said Rogers.

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