



Electronic skin

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## FLEXIBLE, RECYCLABLE ELECTRONIC SKIN HEALS ITSELF

 TELECOMMUNICATIONS

### **A new type of electronic skin embedded with sensors can heal itself and is fully recyclable**

We have already seen temporary tattoos that can be used as [health trackers](#) and as an [electronic interface](#). But these devices currently have limited lifespans, making them unsuitable or too expensive for widespread use. Researchers from the [University of Colorado Boulder](#) have now developed a healable, recyclable, electronic skin which can be embedded with flexible sensors. The e-skin can be bent or twisted to create a custom fit. It offers a way to design more cost-effective and recyclable health monitors, robotics and prosthetics.

The skin was created by teams in the university's Mechanical Engineering, Materials Science, Chemistry and Biochemistry departments, and led by assistant professor Jianliang Xiao. The skin uses a novel thermoset polymer, called polyimine, laced with silver nanoparticles. Their use improves the mechanical strength, chemical stability and electrical conductivity of the material. Thermosets are plastics that can be shaped through heating, in this case to fit the contours of a human limb or a robotic hand. "Let's say you wanted a robot to take care of a baby," explains Zhang. "In that case you would integrate e-skin on the robot fingers that can feel the pressure of the baby". The e-skin has been embedded with pressure, temperature, humidity and air flow sensors to better mimic biological skin.

When damaged, the new e-skin can be healed using a mix of three commercially available compounds in ethanol. To recycle the skin, it is soaked in the same ethanol solution, which causes the polymers to degrade and the silver nanoparticles to precipitate out. The recycled solution and

nanoparticles can then be used to make new e-skin. Said Xiao, “Given the millions of tons of electronic waste generated worldwide every year, the recyclability of our e-skin makes good economic and environmental sense.” What commercial uses might there be for a healable, recyclable electronic skin?

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