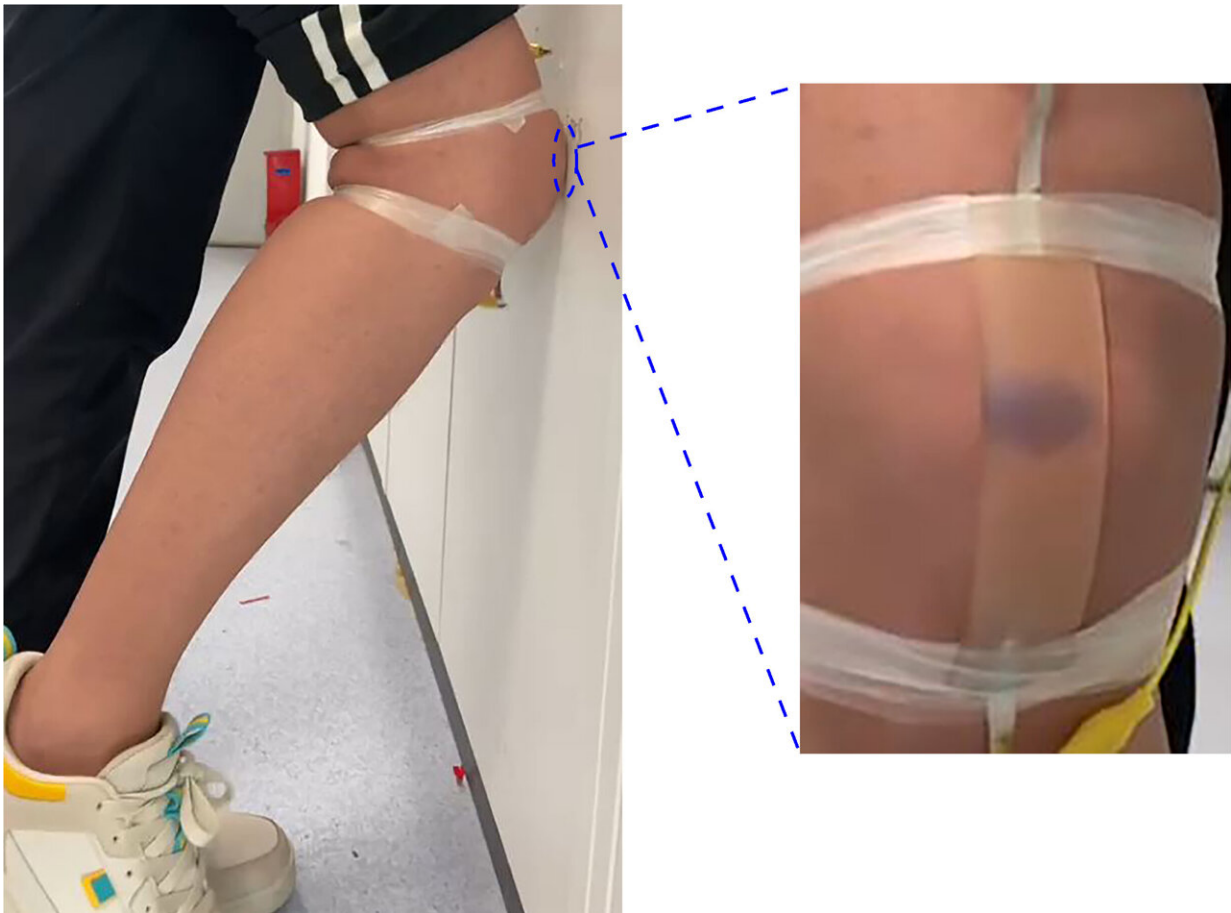


Bruisable artificial skin could help prosthetics, robots sense injuries

June 16 2021



An artificial skin attached to a person's knee develops a purple "bruise" when hit forcefully against a metal cabinet. Credit: Adapted from ACS Applied Materials & Interfaces

When someone bumps their elbow against a wall, they not only feel pain but also might experience bruising. Robots and prosthetic limbs don't have these warning signs, which could lead to further injury. Now, researchers reporting in *ACS Applied Materials & Interfaces* have developed an artificial skin that senses force through ionic signals and also changes color from yellow to a bruise-like purple, providing a visual cue that damage has occurred.

Scientists have developed many different types of electronic skins, or e-skins, that can sense stimuli through electron transmission. However, these [electrical conductors](#) are not always biocompatible, which could limit their use in some types of prosthetics. In contrast, ionic skins, or I-skins, use ions as charge carriers, similar to [human skin](#). These ionically conductive hydrogels have superior transparency, stretchability and biocompatibility compared with e-skins. Qi Zhang, Shiping Zhu and colleagues wanted to develop an I-skin that, in addition to registering changes in electrical signal with an applied force, could also change color to mimic human bruising.

The researchers made an ionic organohydrogel that contained a molecule, called spiropyran, that changes color from pale yellow to bluish-purple under mechanical stress. In testing, the gel showed changes in color and electrical conductivity when stretched or compressed, and the purple color remained for 2–5 hours before fading back to yellow. Then, the team taped the I-skin to different body parts of volunteers, such as the finger, hand and knee. Bending or stretching caused a change in the [electrical signal](#) but not bruising, just like human skin. However, forceful and repeated pressing, hitting and pinching produced a color change. The I-skin, which responds like human skin in terms of electrical and optical signaling, opens up new opportunities for detecting damage in prosthetic devices and robotics, the researchers say.

"Colorimetric Ionic Organohydrogels Mimicking Human Skin for

Mechanical Stimuli Sensing and Injury Visualization" is published in *ACS Applied Materials & Interfaces*.

More information: Wenlian Qiu et al, Colorimetric Ionic Organohydrogels Mimicking Human Skin for Mechanical Stimuli Sensing and Injury Visualization, *ACS Applied Materials & Interfaces* (2021). [DOI: 10.1021/acsami.1c04911](https://doi.org/10.1021/acsami.1c04911)

Provided by American Chemical Society

Citation: Bruisable artificial skin could help prosthetics, robots sense injuries (2021, June 16) retrieved 25 April 2024 from

<https://phys.org/news/2021-06-bruisable-artificial-skin-prosthetics-robots.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.