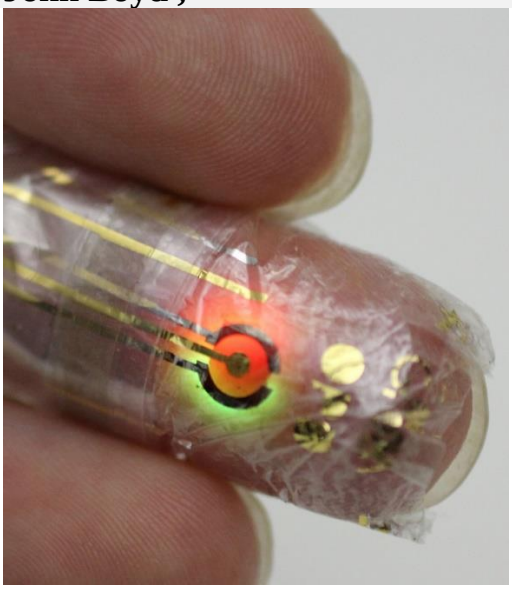
Electronic Skin Can Track Your Health And Fitness

John Boyd ,



Light from red & green PLEDs is directed into the finger. Photodetectors catch the reflected light from inside the finger and provide a measure of blood oxygen. The output of a detector is shown in the photo below.

Japanese researchers have taken a step closer to creating electronic skin—e-skin—by employing flexible electronics that can be worn as a second skin for biomedical and other applications. The aim is to have e-skin eventually become as much a part of our daily lives as the clothes we wear.

If this eventuates, athletes will use e-skin to view their heart rates, sugar levels and work rate. It could provide doctors with continuous data on patients' vital signs without the need for repeatedly attaching and removing medical equipment, while the rest of us might employ it to monitor our body healthmetrics. Meanwhile, engineers could put down their tablets when doing tricky repair work, and instead view maintenance procedures displayed on their arms.

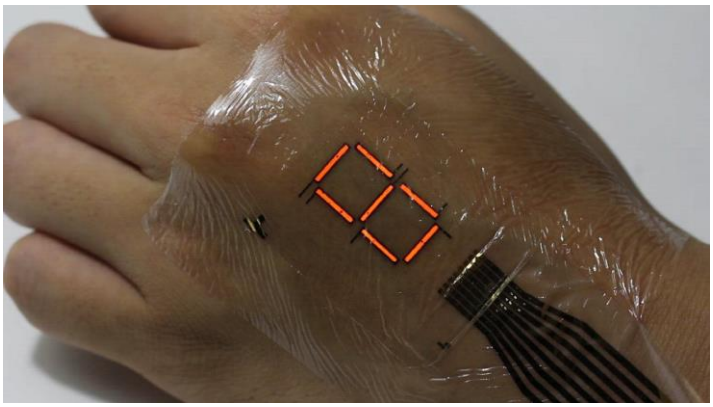
Such is the promise of ultra-thin, flexible, and non-constraining skin-level electronics says Takao Someya, head of the research group seeking to develop e-skin at the University of Tokyo's Graduate School of Engineering.

Wearable electronics are nothing new—ask Google GOOGL +0.56% about its Google Glasses. And flexible electronic devices have been available for some time, but they don't retain their characteristics for long in the open air or in damp conditions, while plastic substrates needed to support them are typically limited in their flexibility, and are impractically thick and lack stability.

So the announcement that Someya's group have developed an ultrathin, ultra-flexible, protective film to enable the wearing of a multifunction polymer light emitting diode (PLED) display and organic photodetectors is worth taking note of.

The film is composed of alternating layers of a ceramic material (silicon oxynitrite) and Parylene (a polymer coating). According to Someya, it protects the electronics and rubber-based elastic substrate from oxygen and water vapor, extending their lifetime from a few hours, which is the norm, to several days. Overall thickness of the device is a measly 3 microns (3 millionths of a meter), which—incredibly—is ten times thinner than our skin.

The researchers have integrated green and red PLEDs with the photodetectors to fabricate a reflective pulse oximeter: a device to measure the oxygen concentration in the blood. Red and green PLEDs shine directly into the finger, and the light reflected back from inside the finger (see top photo) is picked up by the photodetector. This provides a measure of blood oxygen. A readout from a detector is shown on the PLED display in the following photo.



E-skin at work. Sensor readout shown on PLED display attached to the hand.

In a paper just published in Science Advances, the researchers write, "The ultrathin organic optical systems shown in this work represent ultra-flexible organic optical devices that are operated in ambient atmosphere. … Ultimately, flexible organic optical sensors may be directly laminated on organs to monitor the blood oxygen level during and after surgery."