FLEXIBLE DEVICES

Electronic skins sweat it out

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Credit: Caltech

Electronic skins are soft conformable electronic systems that can mimic and expand the functionalities of human skin. To date, most examples have demonstrated basic sensing of physical properties and have been driven by energy-harvesting or battery-powered systems. Targeted applications, such as personal health monitoring or assistive technologies, require more complex capabilities that have high power requirements. However, creating self-powered systems that can generate sufficient energy densities to power these electronic skins remains challenging. Wei Gao and colleagues at the California Institute of Technology have now developed a self-sufficient perspiration-powered integrated electronic skin.

The researchers used a flexible array of biofuel cells that converts lactate in human

sweat into electrical energy at power densities of up to 3.5 mW cm^{-2} .

Their electronic skin is made of an ultrathin polyimide film that contains the nano-engineered biofuel cell, a biosensor array, a programmable system on chip and other additional circuitry. The system is able to perform multiplexed sensing of several sweat biomarkers, such as urea and glucose, and also sense skin temperature and strain. Furthermore, the system can wirelessly transmit biomarker data and, using the strain sensors and gesture recognition, control a robotic arm in real time.

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