Scientists Develop Washable Fabric That Harvests Energy From Motion

The flexible, waterproof material could be used in sportswear to help power mobile devices.

By Stephanie Mlot
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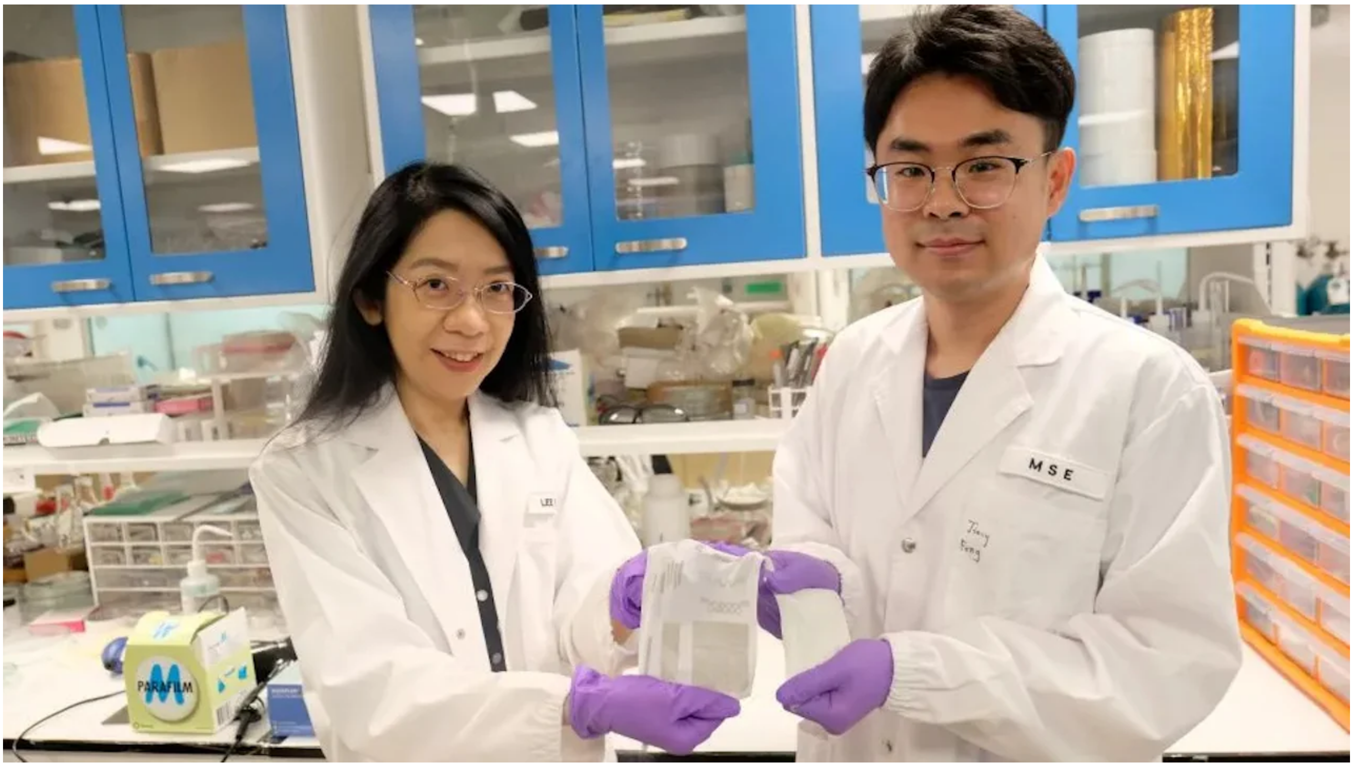

Professor Lee Pooi See (left) and PhD student Jiang Feng (right) show off their stretchable, waterproof fabric of the future (Photo: NTU Singapore)

Scientists at Nanyang Technological University, Singapore developed a flexible waterproof "fabric" capable of converting body movement into electrical energy for powering wearable devices.

The key ingredient, according to NTU Singapore, is a polymer that when pressed or squeezed converts vibrations produced by the smallest motions into an electric charge. In a proof-of-concept experiment, researchers found that tapping a 4cm piece of the material—made with a spandex base layer and enforced with a rubber-like component—generates enough electrical energy to light 100 LED bulbs.

Power dressing—the concept of a sweater acting as a flashlight or a pair of jeans charging your phone—has been analyzed for more than two decades. However, most electricity-producing fabrics don't hold up to long-term use, especially when repeatedly cleaned in a washing machine.

"There have been many attempts to develop fabric or garments that can harvest energy from movement, but a big challenge has been to develop something that does not degrade in function after being washed, and at the same time retains excellent electrical output," study leader and NTU Associate Provost Professor Lee Pooi See said in a statement.

That's not a problem for NTU Singapore's material, which holds up when washed, folded, and crumpled. The team estimates their fabric can maintain stable electrical output for up to five months, highlighting its potential as a smart textile or wearable power source.

"We demonstrated that our prototype continues to function well after washing and crumpling," Lee explained, adding that it "could be woven into t-shirts or integrated into soles of shoes to collect energy from the body's smallest movements, piping electricity to mobile devices."

The prototype produces a 2.34-watts-per-square-meter charge in two ways: when pressed or squashed (piezoelectricity), or when it comes into contact or creates friction with other materials, like skin or rubber gloves (triboelectric effect). Attach it to an arm, leg, hand, elbow, or even shoe insole, and the textile can harness energy from a range of human movements like running or playing sports.