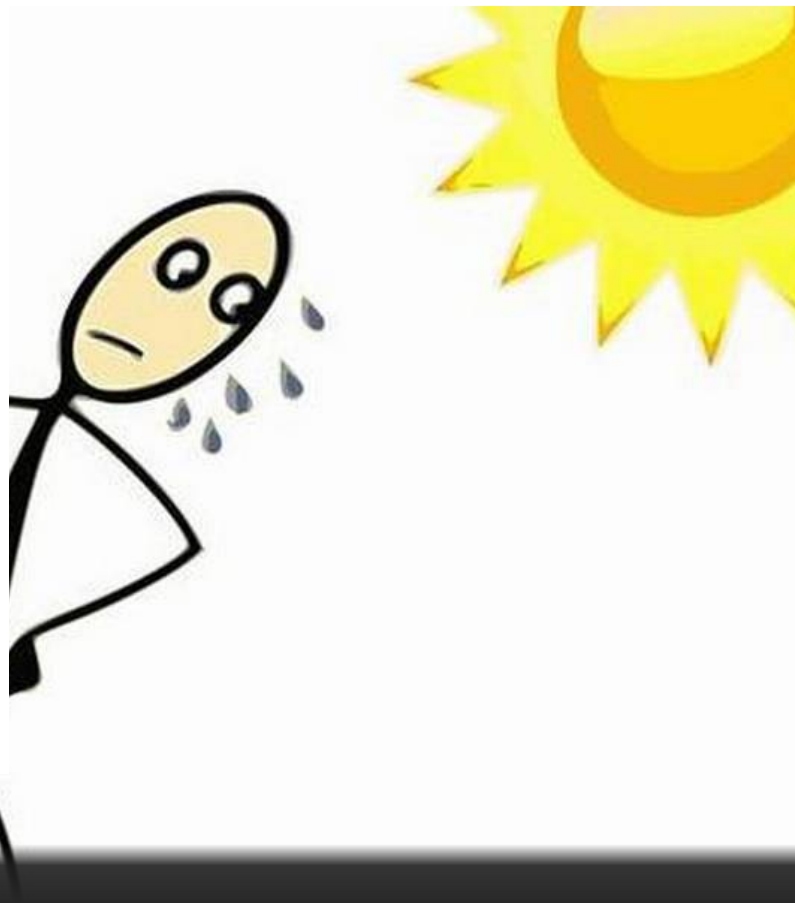


it's powered by human sweat

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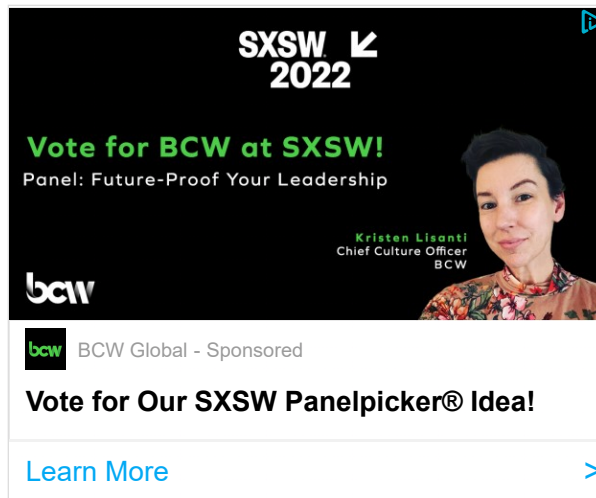


In a first, scientists from the Nanyang Technological University (NTU), Singapore, have introduced a stretchable battery that is powered by human perspiration.

Dr. Gurunathan Thangavel, a native of Archampatti in Karur district, Tamil Nadu, is among the three scientists who designed and developed the battery that can discharge about 20 hours of electricity derived from just 2 ml of sweat.

The soft stretchable battery comprises printed silver flake electrodes that generate electricity in the presence of sweat. The battery looks like a paper bandage that can be affixed to a flexible sweat-absorbent textile which draws power from sweat and transfers it to wearable devices, including smart watches and arm straps, via Bluetooth.

To demonstrate its potential use when it becomes incorporated in wearable biosensors and other electronic devices, the scientists tested their device with artificial human sweat. “The battery does not contain heavy metals or toxic chemicals unlike conventional batteries, which are often built using unsustainable materials that are harmful to the environment and at times pose a threat of explosion. We have applied to patent this technology to take it forward for commercial use,” says Dr. Gurunathan, a Senior Research Fellow in NTU’s School of Material Science and Engineering.



“Conventional batteries use organic electrolyte, thereby limiting their application in skin-interfering electronics. Our battery conforms to the skin of users by our well-synthesised hydrophilic elastomeric binder. This device provides an opportunity to do away with toxic materials used in batteries,” he said.

In a separate trial, the team reported that an individual wearing the sweat-powered battery around the wrist and cycling on a stationary bicycle for 30 minutes was able to generate a voltage of 4.2 V and output power of 3.9 mW that was sufficient to power a commercial temperature sensor device and send the data to a smartphone via Bluetooth.

The technology heralds a previously unreachable milestone in the design of wearable devices. “By capitalising on perspiration, we could be looking at a more environmentally friendly way of powering wearable devices that does not rely on conventional batteries. It is a near-guaranteed source of energy produced by our bodies. We expect the battery to be capable of powering all sorts of wearable devices,” he quoted Prof. Lee Pooi See, Dean of NTU Graduate College, who led the study, as saying.

According to Dr. Gurunathan, the development of the sweat-powered battery reflected NTU’s commitment to finding solutions to mitigate impact on the environment. The study ‘Printable elastomeric electrodes with sweat-enhanced conductivity wearables’ was published in the peer-reviewed scientific journal *Science Advances* in July.

He said the sweat-powered battery was created by printing ink containing silver flakes and hydrophilic poly urethane-acrylate (HPUA), which functioned as the battery’s electrodes,

onto a stretchable textile. When the silver flakes came in contact with sweat, its chloride ions and acidity caused the flakes to clump together, increasing their ability to conduct electricity. This chemical reaction also caused an electric current to flow between the electrodes.

Adding that the third member of the team is Dr. Lyu Jian, Research Fellow, Materials Science and Engineering, NTU, Dr. Gurunathan said that the stretchable textile retained a lot of sweat as it was very absorbent, and hence enabling the battery to remain powered even when the rate of sweating became inconsistent.



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