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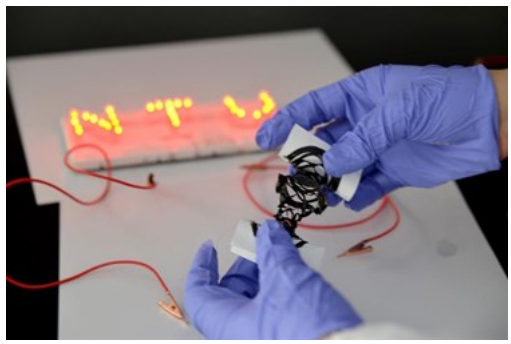
Customisable, fabric-like power source for wearables

A customisable, fabric-like power source that can be cut, folded or stretched without losing its function is said to be the Nanyang Technological University's (NTU) latest creation.



The team claim they have developed this wearable power source – a supercapacitor – which works like a fast-charging battery and can be recharged multiple times.

According to NTU, its supercapacitor has the ability to have its structure and shape edited after it is manufactured, while retaining its function as a power source.

This invention is said to have the capability to be stretched multi-directionally and is less likely to be mismatched when it is joined up to other electrical components.

When edited into a honeycomb-like structure, the team say that the device is able to store an electrical charge four times higher than most existing stretchable supercapacitors. They also claim that when stretched to four times its original length, it maintains nearly 98% of the initial ability to store electrical energy, even after 10,000 stretch-and-release cycles.

The team experimented by pairing the supercapacitor with a sensor and placing it onto the human elbow, which they said, resulted in better performance than existing stretchable supercapacitors. A stable stream of signals was also apparently offered even when the arm was swinging. These signals can be transmitted wirelessly to external devices such as one that captures a patient's heart rate.

The team has filed a patent for the technology and believe that their creation could be easily mass-produced as it would rely on existing manufacturing technologies. They also think that production cost would be low, estimating it around SGD$0.13 (USD$0.10) to produce 1cm2 of the material.

Professor Chen Xiaodong of NTU, said, "A reliable and editable supercapacitor is important for development of the wearable electronics industry. It also opens up all sorts of possibilities in the realm of the IoT when wearable electronics can reliably power themselves and connect and communicate with appliances in the home and other environments.

"My own dream is to one day combine our flexible supercapacitors with wearable sensors for health and sports performance diagnostics. With the ability for wearable electronics to power themselves, you could imagine the day when we create a device that could be used to monitor a marathon runner during a race with great sensitivity, detecting signals from both under and over-exertion."

The NTU supercapacitor is said to be made of strengthened manganese dioxide nanowire composite material. According to NTU, the nanowire structure, which is strengthened with a network of carbon nanotubes and nanocellulose fibres, allows the electrodes to withstand the associated strains during the customisation process.

Dr Loh Xian Jun from the Institute of Materials Research and Engineering, who collaborated with NTU on the project, added: "Customisable and versatile, these interconnected, fabric-like power sources are able to offer a plug-and-play functionality while maintaining good performance. Being highly stretchable, these flexible power sources are promising next-generation 'fabric' energy storage devices that could be integrated into wearable electronics."

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