# Paper-thin biodegradable batteries could power future wearables

By E&T editorial staff

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Scientists have developed paper-thin zinc batteries that could become an environmentally sustainable option for powering flexible and wearable electronic systems.

The team from Nanyang Technological University (NTU) in Singapore developed the batteries from electrodes that have been screen-printed on to both sides of a piece of cellulose paper which is then reinforced with hydrogel.

Once the battery has been expended, it can be buried in soil, where it breaks down completely within a month.

In a proof-of-concept experiment, a 4cm x 4cm square of printed paper battery was used to power a small electric fan for  45 minutes. Bending or twisting the battery did not interrupt the power supply.

In another experiment using a 4cm x 4cm battery to power an LED, the scientists showed that despite cutting away parts of the paper battery, the LED remained lit.


The scientists think their printed battery could be integrated into flexible electronics such as foldable smart phones that are already on the market, or biomedical sensors for health monitoring.

https://eandt.theiet.org/content/articles/2021/12/paper-thin-biodegradable-batteries-could-power-future-wearables/

Professor Fan Hongjin, the study's co-lead author, said: "Traditional batteries come in a variety of models and sizes, and choosing the right type for your device could be a cumbersome process.

"Through our study, we showed a simpler, cheaper way of manufacturing batteries, by developing a single large piece of battery that can be cut to desired shapes and sizes without loss of efficiency. These features make our paper batteries ideal for integration in the sorts of flexible electronics that are gradually being developed."

Assistant Professor Lee Seok Woo, who also co-authored the study, said: "We believe the paper battery we have developed could potentially help with the electronic waste problem, given that our printed paper battery is non-toxic and does not require aluminium or plastic casings to encapsulate the battery components.

"Avoiding the packaging layers also enables our battery to store a higher amount of energy, and thus power, within a smaller system."

Last month, another team demonstrated a new technology using electrochemistry to efficiently separate and recover the metals in spent lithium-ion batteries – potentially making them more recyclable.

BATTERIES WEARABLE TECHNOLOGY RESEARCH AND INNOVATION FLEXIBLE ELECTRONICS

**Image credits:** Nanyang Technological University (NTU), Singapore .