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New battery biodegrades after a month in soil

E-waste is one of the most rapidly growing and toxic waste streams in the world today, but scientists at the **Nanyang Technological University (NTU)** in Singapore have come up with a partial solution by creating biodegradable batteries that can actually be buried in soil once they've reached the end of their lives.

The batteries are paper-thin and are made from biodegradable **zinc**. The team believes they could one day become an environmentally friendly option for powering smartphones and flexible wearable electronic devices.

The zinc batteries are made of electrodes that are screen-printed on both sides of a piece of cellulose paper that's been reinforced with hydrogel. The electrodes allow electrical currents to leave and enter the battery. Once the battery runs out of power, all the user must do is bury it in the **soil**. After a month, the battery will have broken down completely.

So far, the team has demonstrated how a battery consisting of a small square of printed paper (4cm by 4cm) can power a small electric fan for at least 45 minutes, and that bending or twisting the battery does not interrupt the power supply. In another experiment using the same-sized paper battery, the scientists were able to show that the battery continues to work, even if part of it is cut away.

The scientists believe that their paper-thin battery could be a good option for flexible electronics like foldable smartphones or biomedical sensors for health monitoring.

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

On top of being **non-toxic**, the newly developed battery also has the added benefits of “avoiding the packaging layers,” which “also enables [the] battery to store a higher amount of energy, and thus power, within a smaller system,” explains Assistant Professor Lee Seok Woo, another co-lead author of the study.

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