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Singapore Scientists Develop Biodegradable Batteries That are Printed on Paper

Singapore-based Nanyang Technological University (NTU) has developed paper-thin biodegradable zinc batteries that could sustainably power wearable electronics in future.

A team of scientists at the Nanyang Technological University (NTU) in Singapore have developed paper-thin **biodegradable** zinc batteries in an attempt to find a sustainable option for powering flexible and wearable electronic systems.

As the global demand rises due to the transition to clean energy, this one-of-a-kind innovation based on paper electronics is believed to have promising potential in becoming an integral part of next-generation functional devices.

The paper-thin zinc batteries are made of electrodes that are screen printed onto both sides of a piece of cellulose paper which is then reinforced with hydrogel. The thickness of the battery is around 0.4mm, which is roughly the thickness of two strands of human hair.

As the printed paper items are extremely thin and non-toxic, they do not require aluminium or plastic casings or packaging to encapsulate the battery components. Also, avoiding the packaging layers enables the battery to store a higher amount of energy, and thus power, within a smaller system.

Once the battery reaches the end of its usable life, it can be buried in the soil, where it breaks down completely within a month.

According to the journal of Advanced Science, the NTU research team used a 1.5 in x 1.5 inches (4 cm x 4 cm) square printed paper battery to successfully power a small electric fan for up to 45 minutes. The researchers also pointed out that even bending or twisting the battery did not affect the power supply.

Also, in another experiment they used a 4cm x 4cm battery to power an LED where it remained lit even after cutting away parts of the paper battery.

The research team opine that their biodegradable paper-thin batteries could be used for flexible electronics such as wearables and foldable smartphones. They could also be used in biomedical sensors for health monitoring. It could also solve the issue of finding batteries of the right size.

“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,” says Lee Seok Woo, Assistant Professor at NTU and co-author of the study in a press statement.