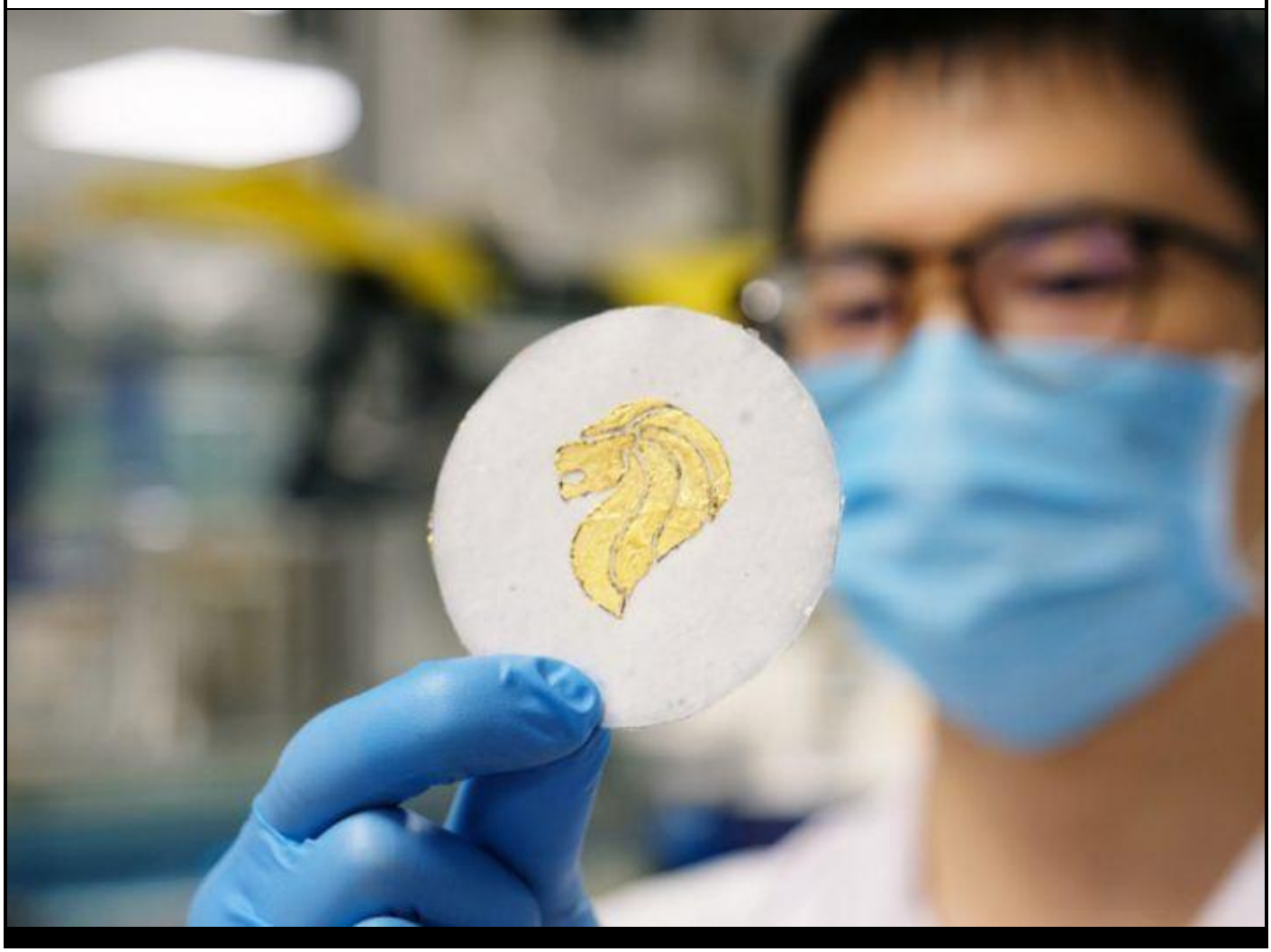
MACHINES

Scientists develop new battery that is paper-thin and fully biodegradable

by Leigh Mc Gowran

1 HOUR AGO SAVE ARTICLE



The paper battery is 0.4mm thick. Image: NTU Singapore

It is hoped that these paper batteries could become a sustainable option for powering flexible and wearable electronics.

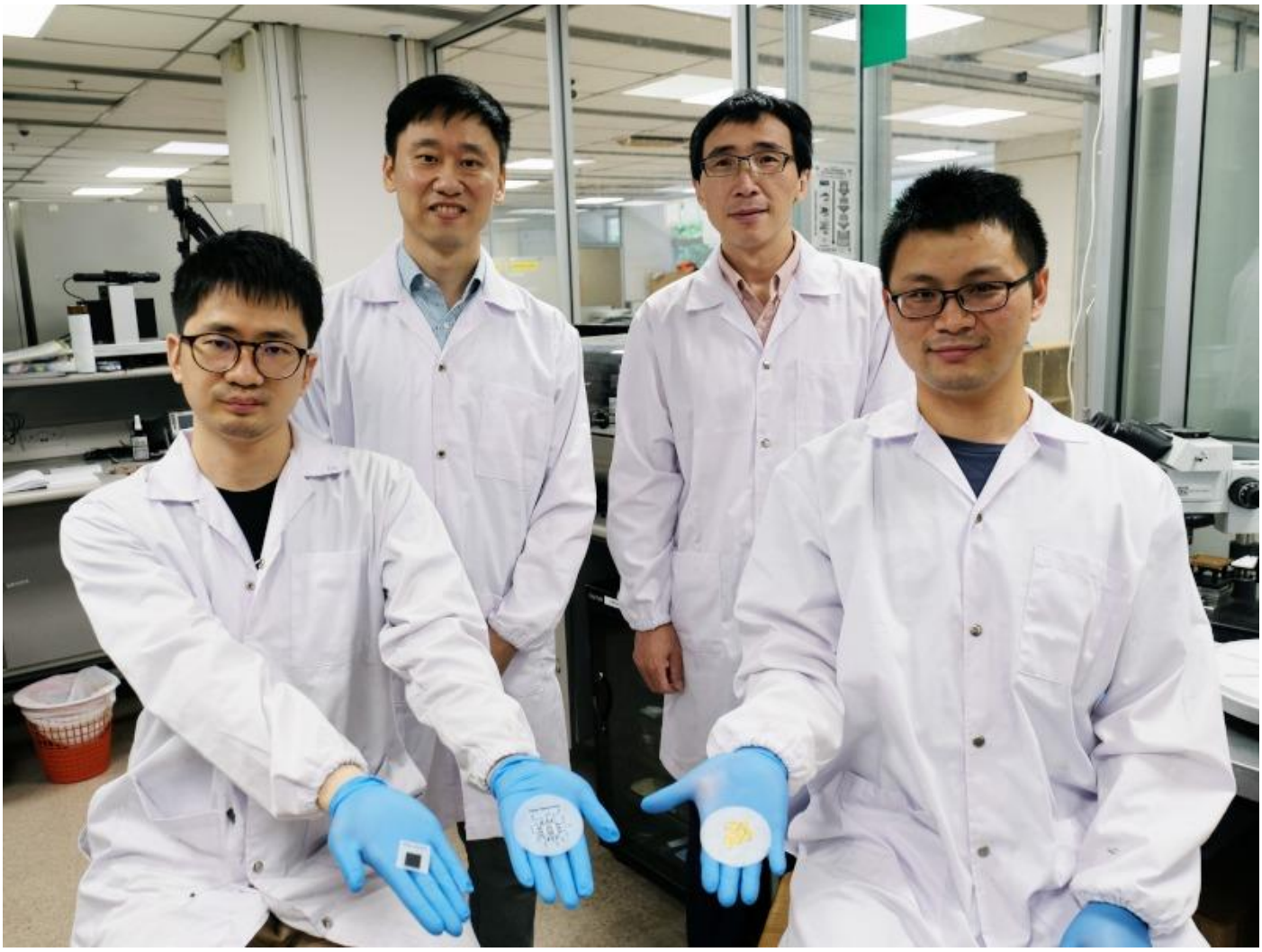
Scientists in Singapore have developed a new type of paper-thin, eco-friendly battery that can be easily adjusted in size and requires no packaging.

The researchers at Nanyang Technological University (NTU) hope that this new battery could provide a sustainable form of power for flexible and wearable electronic systems.

The zinc battery is made up of electrodes printed on to both sides of a piece of cellulose paper that is reinforced with hydrogel. The final product is 0.4mm thick, about the thickness of two strands of human hair.

Once the battery has been expended it can be buried in soil, where it breaks down completely within a month, according to the researchers' study published in Advanced Science.

In this proof-of-concept study, the NTU team also demonstrated how a 4cm square of printed paper battery could power a small electric fan for at least 45 minutes. The battery is designed to be flexible, and researchers said that bending or twisting the battery did not interrupt the power supply.



From left: Dr Li Jia, assistant professor Lee Seok Woo, Prof Fan Hong Jin and Dr Yang Peihua. Image: NTU Singapore

Co-lead of the study Prof Fan Hong Jin said choosing the right sized battery for a device can 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 added that these batteries could help with the rising electronic waste problem as the materials are non-toxic and do not require any aluminium or plastic casing.

An EU-funded study recently predicted that 78m batteries will be dumped every day by 2025.

“Avoiding the packaging layers also enables our battery to store a higher amount of energy, and thus power, within a smaller system,” Seok Woo said.

To develop a thinner, lighter battery prototype with no packaging required, the NTU scientists said they created a “sandwich design” for the batteries, with the electrodes being like bread slices and the cellulose paper being like the sandwich filling.

The cellulose paper is reinforced with hydrogel to form a dense separator for the battery. After the electrodes were added, the battery was immersed in an electrolyte and a layer of gold thin foil added to increase the conductivity.

Going forward, the NTU team hopes to demonstrate the integration of the printed paper battery with other concepts such as printed electronics, electronic skins and energy storage systems deployed in the environment.