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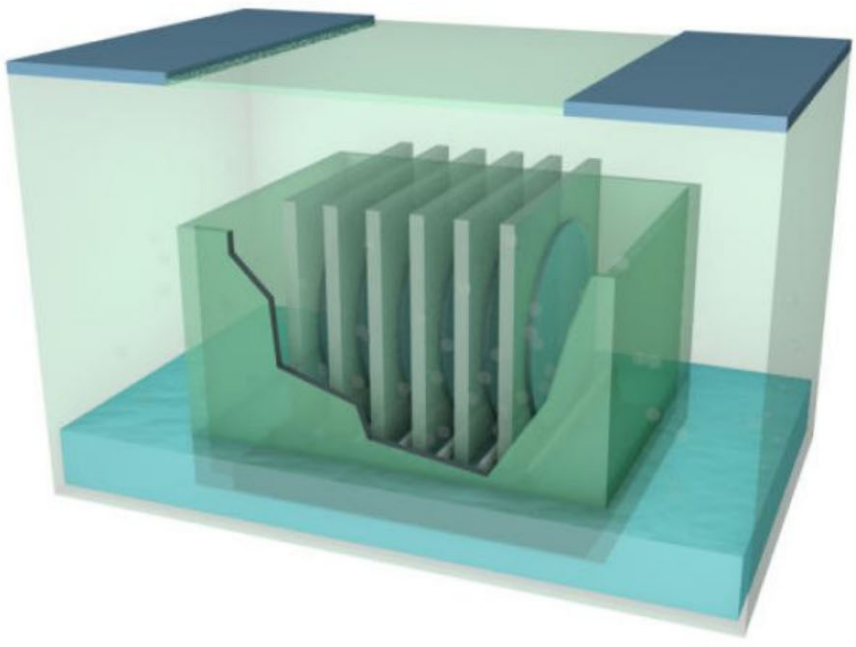
PREMIUM

Clean water from humid air? Just add sunlight



Clean water can be harvested through condensation using stacks of saturated hydrogel. ST PHOTO: LEE HUP KHENG

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Marcia Lee

SINGAPORE - A research team at the National University of Singapore (NUS) has developed a zinc-based hydrogel that can, with natural sunlight, harvest clean water from humid air, including evaporation from water bodies like the reservoirs in Singapore.

At the heart of it is zinc oxide, a compound found in sunscreens and which functions as a cost-effective and efficient water absorber.

With an optimal absorption cycle of 15 minutes and desorption of 5 minutes, the gel can collect up to 14 times its weight in water a day and be reused more than 1,000 times - a feat that is far superior to that of commercially-available drying agents like silica gel, which can absorb only about 10 per cent as much water at one go. Also, most of these drying agents can be used only once.

The team that developed the new gel comprises Assistant Professor Tan Swee Ching, the leader, and doctoral students Dilip Krishna Nandakumar and Zhang Yaoxin. They are from NUS engineering faculty's department of materials science and engineering.

Originally, they had envisioned producing a dehumidifying solution to Singapore's hot and humid climate, but expanded it to include water harvesting to help overcome the huge loss of water suffered by local reservoirs because of the hot and humid weather, Assistant Professor Tan told The Straits Times on Tuesday (July 9).

"About 45 million cubic metres of water is lost from reservoirs through evaporation each year. By harnessing the moisture-rich air commonly found above water surfaces, our hydrogel can collect water which would otherwise be lost to the environment," he said.

The hydrogel can be used in floating water harvesters which have sponges that soak up water for the hydrogel to absorb via humid air pockets.

Once absorbed, clean water can be harvested by placing gel plates in a container exposed to natural sunlight, causing water from the plates to condense and collect at the bottom of the container.

The team found that water harvested from a local beach had almost negligible salt content.

"Unlike processes like desalination, which are energy-intensive, water collected using the hydrogel requires less treatment," Asst Prof Tan said.

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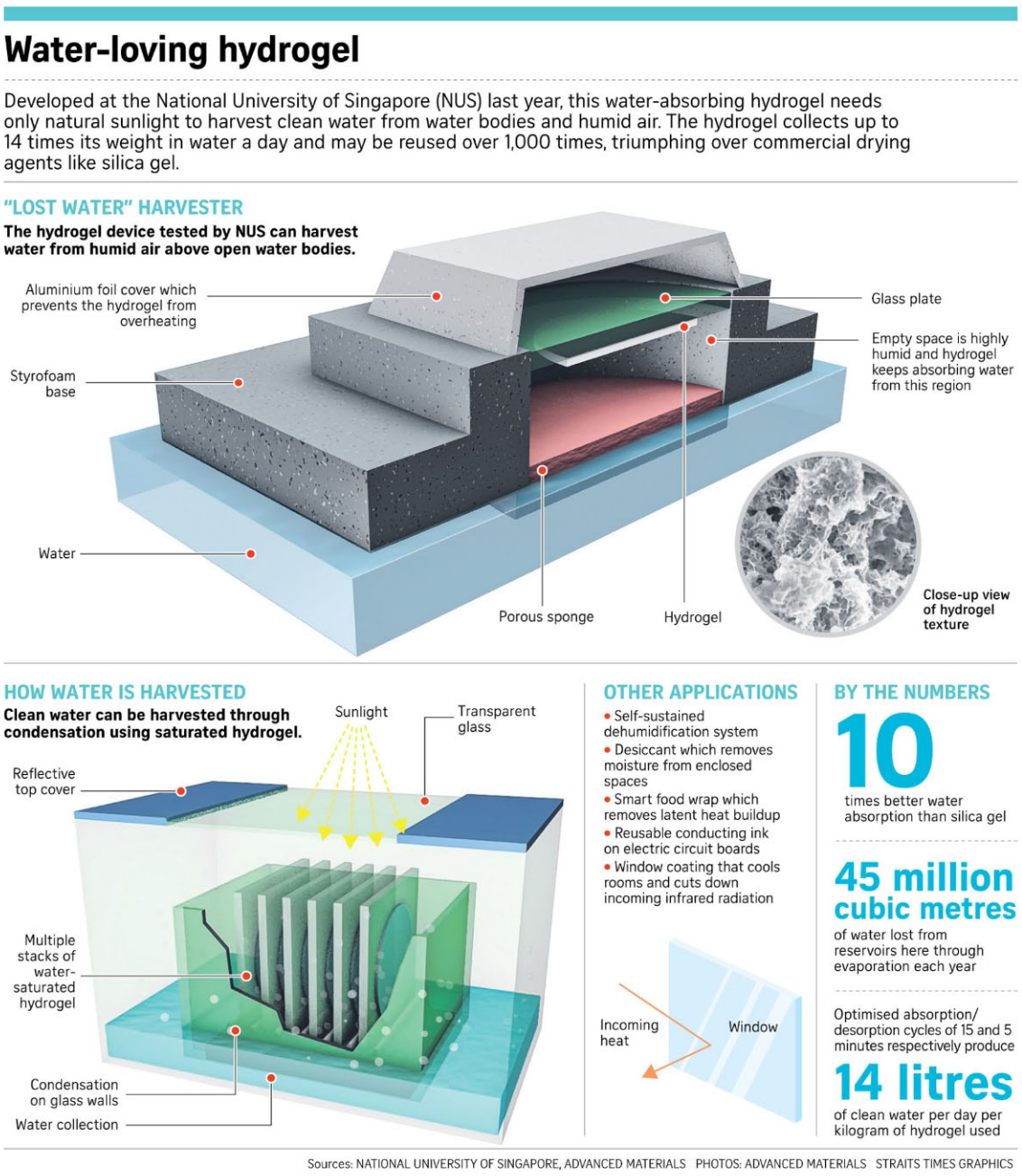

The water harvesters can be attached to the undersides of floating solar panel systems, or function on their own as floating water-capturing farms.

"This could benefit rural communities where access to clean water remains a challenge. We hope to contribute towards mitigating the global water crisis," he added.

With funding from Temasek Foundation Ecosperity, a non-profit philanthropic organisation, the researchers are now working on producing the hydrogel for industrial use.

They have set up a company, UltraDry, and are looking for a manufacturing plant to produce the hydrogel for various uses, including desiccants, food wrap and reusable conducting ink for circuit boards.

Several companies, including multinationals, in the food packaging, desiccant and heating, ventilation and air conditioning industries, have expressed interest in working with them to develop the hydrogel for commercial use, the team members told The Straits Times on Tuesday (July9).

Meanwhile, the researchers are working on developing variants of the hydrogel that will use other minerals, apart from zinc oxide.