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Energy-efficient desalination worth its salt



The Australian, Australia

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Energy-efficient desalination worth its salt

TIM DODD

Monash University researchers have found a new way to desalinate water using only sunlight and a few cheap materials.

The new system can be built for a few dollars and has an operating cost of virtually zero, according to chemical engineering professor Xiwang Zhang, who led the research team.

It works by evaporating water off a black disc that is heated by the sun, and the steam is captured by a transparent dome that sits over the top.

While it does not have the capacity to desalinate water for a town or a city, it could easily handle the drinking water needs of a family or a village, said Professor Zhang, who is also director of the

ARC Research Hub for Energy-efficient Separation.

The new system is more effective than other solar-powered desalination systems because it doesn't require any extra energy input and it can work for a long period without maintenance.

It avoids a problem that typically affects solar evaporation systems: the accumulation of salt crystals on the evaporation surfaces, which reduces efficiency and eventually stops the process.

In the Monash device the salt crystallises only at the outside of the disc because of a special layered structure of the evaporation disc.

"This design leads to salt crystallisation only at the edge of the evaporation disc, spatially isolated from the major part of the active surface for water evaporation. By

weakening the binding force between the salt crystals and the evaporation disc, the salts fall off automatically under gravity," says the paper, titled Spatially Isolating

Salt Crystallisation from Water Evaporation for Continuous Solar

Steam Generation and Salt Harvesting, and published in the journal *Energy and Environmental Science*.

The system has run successfully for more than 600 hours of continuous operation under arti-

ficial illumination that resembles sunlight.

Professor Zhang said the 1sq m of the system could generate 6 litres to 8 litres of water a day when the sun was shining, with almost 100 per cent salt removal.

His team created the system using cotton thread to carry saline water upward, using capillary action, to the centre of the evaporation disc.

Filter paper traps the pure water, pushing the salt to the edge of the disc where it crystallises.

The system has another advantage over the energy-hungry reverse osmosis desalination systems that have been installed, at high cost, to drought-proof many of Australia's major cities.

Unlike reverse osmosis, which captures the salt in a membrane, evaporation does not produce

highly salty brine, which can be an environmental hazard.

Professor Zhang said the technology also had the potential to be used to purify waste water and mine tailings.

"We hope this research can be the starting point for further research in energy-passive ways of providing clean and safe water to millions of people, illuminating environmental impact of waste and recovering resource from waste," he said.

Professor Zhang said it also had great potential to ease the growing problem of water security, with more than 800 million people across the world believed to lack clean water.

The current energy-intensive approaches to water treatment use about 3 per cent of the world's energy supply.

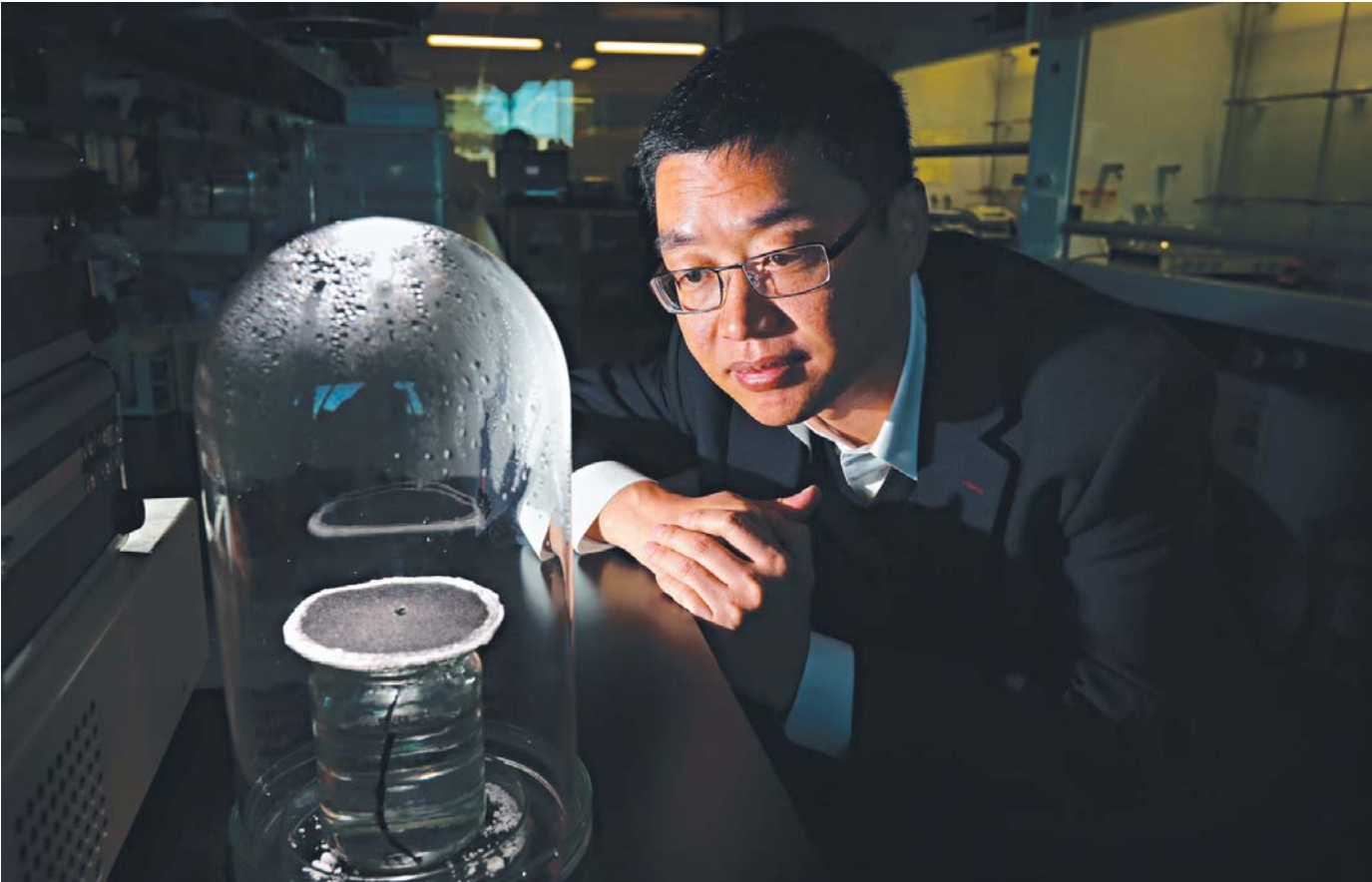
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STUART McEVOY

Monash chemical engineering professor Xiwang Zhang's team has invented a new way of desalinating water using only sunlight and a few cheap materials