Breakthrough device can extract clean drinking water directly from the air without electricity

Engineers at the Massachusetts Institute of Technology (MIT) have successfully created a device that can extract clean drinking water directly from the air without electricity.

Engineers at the Massachusetts Institute of Technology (MIT) have successfully created a device that can extract clean drinking water directly from the air without electricity. This technology is aimed at areas where fresh water is scarce, where traditional sources such as rivers and lakes cannot meet the demand. According to statistics, there are currently more than 2.2 billion people worldwide lacking clean water, with 46 million people in the US alone.

The device, called the Atmospheric Water Harvesting Window (AWHW), uses a special hydrogel sheet shaped like black bubble wrap. These dome-shaped bubbles absorb water vapor from the air at night when humidity is high. During the day, sunlight evaporates the stored water, condensing it on the glass surface and flowing through a tube into drinkable water.

The impressive thing is that AWHW works completely passively, without batteries or solar panels. When tested in Death Valley (California) - one of the driest places in North America, a 1m² panel collected 57-161.5ml of water/day even with a humidity of only 21%, surpassing similar passive devices.

'We want to deploy this technology in areas where solar energy is difficult to access,' said MIT professor Xuanhe Zhao. 'This is a stepping stone to scaling up. People can install multiple panels in parallel to provide real drinking water.'

The team also solved the problem of salinity, a weakness of traditional hydrogels. By mixing glycerol into the mixture, they kept the lithium chloride salt intact in the gel without leaking into the finished water. Test results showed that the lithium ion concentration was below 0.06 ppm, well below the safety threshold.

Hydrogel domes increase the absorption surface area, while a special polymer coating on the glass panel aids cooling for more efficient condensation.

'This is just a prototype,' said Professor Chang Liu, who led the research team. 'We are developing next-generation materials with superior properties, and are also working on multi-panel designs.'

The AWHW has a lifespan of at least a year and promises to provide a sustainable water source in harsh climates. Scientists believe that the vertical panel system could one day provide drinking water to individual households in remote areas.