Graphene filter makes seawater safe to drink

Tom Whipple

A graphene "sieve" has been used to remove salt from seawater in an experiment that scientists hope could improve the efficiency of desalination plants and become one of the first commercial applications of the wonder material.

Because it forms a regular lattice with a hole size similar to the diameter of water molecules, scientists have been trying to use the compound graphene oxide as a filter. However, it swells in water.

Now British scientists have managed to stop the swelling, keeping the holes in the lattice small enough to stop salt but big enough to allow water through. They are working on scaling up the process to see if it could replace conventional desalination plants, which use huge amounts of energy to provide drinking water for desert countries.

When graphene was discovered in 2004, there were predictions that the super-strong, atom-thick form of carbon would revolutionise the economy but few applications have made it into everyday life.

The scientists behind the latest discovery, published in the journal *Nature Nanotechnology*, hope their filters can be in use in five years. Rahul Nair, from Manchester University, said the membrane may need less energy than existing alternatives. "Current technology has to apply high pressures to remove salt from water. Now we have a membrane that can separate salt better. We can expect it to be much more efficient."

Desalination is needed increasingly for drinking water in drought-hit areas. In the Arabian Peninsula, Australia and California, governments have invested heavily in technology to purify sea water. In Britain, the Beckton desalination plant in the Thames Estuary was completed in 2010 and provides clean water for a million people.

The Manchester scientists stopped the material from swelling by coating its sides with epoxy. Professor Nair said that they were looking into combining it with pure graphene to get the same effect. Potentially, the technology would allow scientists to specify the size of holes, fine-tuning them.

In an accompanying article in the journal, Ram Devanathan, from America's Pacific Northwest National Laboratory, said that this technology was desperately needed.

"More than a billion people do not have access to clean water and millions die from water-borne diseases ... There is a pressing need to produce clean water from seawater, brackish groundwater and waste water." However, he added that it may not be easy to produce the filter in large enough quantities and there were questions about how durable it would be.

Times 4th April 2017