

Water purification down the nanotubes

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Nanotechnology could be the answer to ensuring a safe supply of drinking water for regions of the world stricken by periodic drought or where water contamination is rife. Writing in the *International Journal of Nuclear Desalination*, researchers in India explain how carbon nanotubes could replace conventional materials in water-purification systems.

Water shortages and lack of access to safe drinking water will continue to grow as major global problems. At present, more than one billion people lack access to safe drinking water and 2.4 billion people lack access to proper sanitation, nearly all of them in the developing countries. At present a third of the world's population live in water-stressed countries, and by 2025, this is expected to rise to two-thirds.

S. Kar, R.C. Bindal, S. Prabhakar, P.K. Tewari, K. Dasgupta, and D. Sathiyamoorthy of the Bhabha Atomic Research Centre (BARC) in Mumbai, India, explain how new water purification technologies are constantly being investigated but to be viable in the developing world these have to be relatively simple and inexpensive to install, operate, and maintain.

They have turned to nanostructured, the carbon nanotubes, hollow carbon fibers less than a billionth the thickness of a human hair. The unique chemical properties of carbon nanotubes mean that only very small molecules, such as water molecules can pass along their interiors, whereas viruses, bacteria, toxic metal ions, and large noxious organic molecules cannot.

The team points out that the smooth and water repellant interior of carbon nanotubes means that a filter based on this technology would be very efficient, allowing a high flow rate of water through the filter without fouling. Importantly, the power needed to drive water through such a system will be low compared to conventional membrane technology.

However, to be useful as a nanotech filtration system for contaminated water, these nanoscale structures need to be engineered to form well-defined arrangements to allow the efficient decontamination of water. The team has now investigated the potential of forming water filtration systems based on carbon nanotubes that could remove arsenic, fluoride, heavy metals and toxic organic chemicals. Carbon nanotubes have impressive credentials for water purification, the researchers say.

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