

# Chemical Technology

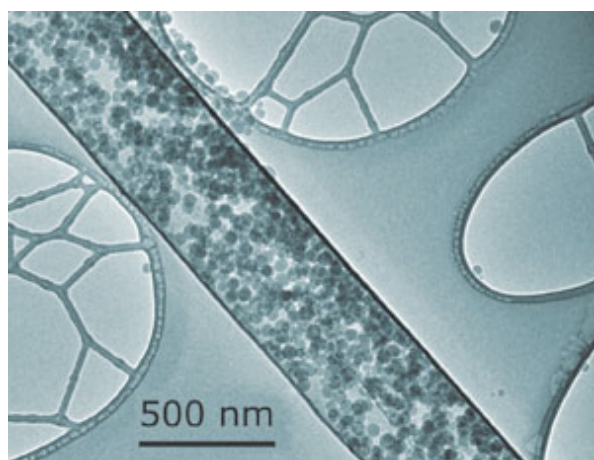
A magazine highlighting the latest applications and technological aspects of research across the chemical sciences.



## Capped carbon nanotubes as chemical couriers

21 December 2007

US scientists have reported a mild new method for trapping liquids and nanoparticles inside carbon nanotubes.



Capped nanotubes could be used for drug delivery

Alexander Yarin's team at the University of Illinois at Chicago, US, have developed a room-temperature method to fill carbon nanotubes with liquids.

The filling of carbon nanotubes with aqueous solutions can have biomedical uses, as Yarin explained, 'Nanotubes with diameters of the order of 100 nm are possible drug carriers, which can deliver biological payloads to a certain location, such as a tumour.'

In Yarin's technique, water is dragged into nanotubes by a self-sustained diffusion mechanism. A toluene solution of a polymer, in this case polycaprolactone, is then pulled into the nanotubes. As the polymer is insoluble in the water already in the tubes, the polymer gathers at the ends and forms caps. As a result, the water becomes trapped within the nanotubes. Crucially, this takes place under mild conditions, which is where this method holds its advantage according to Yarin: 'existing filling methods involve high pressures or temperatures, which are detrimental to biologically-active materials'.

Marc in het Panhuis, a senior lecturer at the University of Wollongong, Australia, forecasted how this technique may avoid current problems involved with using nanotubes for drug delivery: 'This is an elegant way of tuning the properties of nanotubes from within, while the outer surface can be modified to render the nanotube biocompatible'.

Surfactants and particles, such as polystyrene nanospheres, have also been trapped inside carbon nanotubes using this method. This means that the technique could have multiple other future uses, Yarin suggested, such as in 'catalysis, supercoolants, optoelectronics and sensors'.

**"As the polymer is insoluble in the water already in the tubes, the polymer gathers at the ends and forms caps."**

Jon Silversides

[Link to journal article](#)

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**Room-temperature, open-air, wet intercalation of liquids, surfactants, polymers and nanoparticles within nanotubes and microchannels**

Alexander V. Bazilevsky, Kexia Sun, Alexander L. Yarin and Constantine M. Megaridis, *J. Mater. Chem.*, 2008

DOI: 10.1039/b714541c

**Also of interest**

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**Solubility switching of carbon nanotubes**

Researchers in China have discovered a way to change the solubility of carbon nanotubes, creating diverse biological applications.

**Magic impurities not magic nanotubes**

The electrocatalytic properties of some carbon nanotube electrodes are actually caused by impurities, report scientists in the UK.