

Clean water, and the smell of export success

A strong overseas market is expected for an innovative Australian treatment process that uses tiny beads of magnetic resin to speed the removal of dissolved organic carbon (DOC) from drinking water. The process, known as MIEX[®]DOC, has been developed by CSIRO Molecular Science, Orica Watercare and the South Australian Water Corporation.

Dissolved organic carbon enters water as it flows over soil and rotting vegetation, affecting its taste and colour. During treatment, it reduces the effectiveness of water cleansing processes, provides a food source for bacteria and reacts with disinfectants such as chlorine to form potentially harmful by-products. Stringent regulations ensure low levels of dissolved organic carbon in pre-chlorinated water, but existing technologies struggle to make the process cost-effective.

Conventional ion-exchange-type water treatments use a series of columns packed with resin beads to remove organic carbon. As the positively charged resin binds to negatively charged organic carbon compounds, the columns become clogged and have to be removed and washed, causing costly delays.

The new process overcomes this problem by using tiny (150 micrometre) beads of magnetic resin that can be added directly to the water. As the solution is stirred, these MIEX[®] resins rapidly bind to the organic carbon. When the solution is moved to a separation tank, the magnetic property of the resin ensures the tiny resin-organic carbon particles agglomerate and sink. This magnetic property is the key to the success of the MIEX[®]DOC process.

'The magnetic component of the resin means that it acts much more quickly both in the adsorption and the settling stages,' CSIRO's Dr Neil Furlong says. 'If you don't have a magnetic

component, the resin won't settle rapidly, making it difficult to remove from the water. So you have to use much bigger resin particles, which reduces the rate of adsorption.'

Once settled, the resin-organic carbon complex is removed from the water and pumped back into the start of the process, to be used again. During each cycle of treatment, about 10% of the resin is sent off for 'regeneration' in which the bound organic carbon is removed using a salt solution.

Market attraction

The new treatment process has been successfully trialled in South Australia and Western Australia where dissolved organic carbon affects drinking water from the Murray River or underground reservoirs. These trials have led to the approval of a full-scale treatment plant at Wanneroo north of Perth, and construction of a world-first MIEX[®] resin manufacturing pilot plant in Melbourne.

Furlong says the process is likely to be used in regional Australia where raw water quality can be poor, either at full scale or as an upstream 'polishing' process before treatment by other methods. But it is unlikely to be used in

cities such as Sydney or Melbourne where levels of dissolved organic carbon are quite low.

While the Australian market for the MIEX[®]DOC process is small, the potential for overseas markets, where water standards are stringent, is enormous. Orica Watercare is seeking EPA approval for the technology in the United States.

Orica's Dr Hung Nguyen says the technology has a range of other potential applications such as in wastewater treatment, mineral processing and the management of pesticide effluents. This would involve changing the functional group of ion exchange resins.

Research into future applications has been boosted with a \$1 million START grant from the Federal Government, and \$2 million from Orica.

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The MIEX[®]DOC pilot plant.