

Desalinating water without chemicals

Jouke Dykstra, assistant professor of Environmental Technology, is developing a new process to remove toxic ions during the desalination of water.

The production of fresh water from seawater is becoming increasingly important because of the growing water shortage. Often, membranes are used for the desalination. But seawater also contains contaminants such as boron ions. These ions are toxic in high concentrations.

Boron and some other ions are difficult to extract from the water due to their chemical properties. They are amphoteric, meaning their properties vary depending on the acidity. 'It is hard to remove these particles from the water

with standard membrane technology,' says Dykstra. 'You have to add certain chemicals to alter the pH value, but we want to avoid this.'

Model

Dykstra has developed a new theoretical model in collaboration with scientists at the research institutes of Technion in Israel and Wetsus in Leeuwarden. It lets the researchers predict the properties and behaviour of boron ions during the water treatment. Based on this, they have designed a process to remove the boron during desalination. They use capacitive deionization for this, a new technique that does not use a membrane. The water flows through microporous carbon electrodes, and an electrical current causes the ions to

adsorb to the electrodes, removing them from the water. The research was published in PNAS.

Dykstra: 'We are the first to develop a model that lets us predict the behaviour.'

'This model will give us more control over complex chemical processes'

This will give us more control over complex chemical processes.' He says the model can also be used to tackle other water-related problems, such as the removal of arsenic, medicine residues and herbicides. AS