New chlorine-tolerant, desalination membrane hopes to boost access to clean water

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A chemical engineering professor at The University of Texas at Austin is part of a team that has developed a chlorine-tolerant membrane that should simplify the water desalination process, increasing access to fresh water and possibly reducing greenhouse gases.

"If we make the desalination process more efficient with better membranes, it will be less expensive to desalinate a gallon of water, which will expand the availability of clean water around the world," Professor Benny Freeman says.

The research will be published July 28 in the German Chemical Society's journal *Angewandte Chemie*.

Freeman worked primarily with James E. McGrath of Virginia Tech University and Ho Bum Park of the University of Ulsan in South Korea for more than three years to develop the chlorine-tolerant membrane made of sulfonated copolymers. A patent has been filed.

Chlorine must be added to water to disinfect it to prevent a biofilm (stemming from biological contaminants in the raw water) from forming on the membrane, which would reduce its performance. It is then de-chlorinated prior to sending it through the currently used polyamide membranes, which don't tolerate chlorinated water.

"It promises to eliminate de-chlorination steps that are required currently to protect membranes from attack by chlorine in water," Freeman says. "We believe that even a small increase in efficiency should result in large cost savings."

The development could also have a direct impact on reducing carbon-dioxide emissions, which contribute to global warming.

"Energy and water are inherently connected," Freeman says. "You need water to generate power (cooling water for electric power generation stations) and generation of pure water requires energy to separate the salt from the water. That energy is often generated from the burning of fossil fuels, which leads inevitably to the generation of carbon dioxide. Therefore, if one can make desalination more energy-efficient by developing better membranes, such as those that we are working on, one could reduce the carbon footprint required to produce pure water."

Freeman says McGrath and his research group developed novel materials based on an entirely different platform of membranes than those used today in desalination membranes. These new materials are extremely tolerant to aqueous chlorine so their performance doesn't deteriorate in the presence of chlorine.

"Basically, Dr. McGrath radically changed the chemical composition of the membranes, relative to what is used commercially, and the new membranes do not have chemical linkages in them that are sensitive to attack by chlorine," says Freeman, who holds the Kenneth A. Kobe Professorship in Chemical Engineering and the Paul D. & Betty Robertson Meek & American Petrofina Foundation Centennial Professorship in Chemical Engineering.

Source: University of Texas at Austin