New membrane may solve fresh water shortages

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Researchers at Hiroshima University have developed a technology that improves the removal of salt from seawater, a breakthrough that may alleviate the increasing demand for fresh water in some countries.

"A global shortage of fresh water is a long-term challenge that mankind faces in this century," said the director of the ROBUST membrane project, Professor Toshinori Tsuru.

Professor Tsuru and his team have designed a new kind of ultra-thin layered membrane that acts as a sieve and separates salt from seawater to produce fresh water, a technique known as reverse osmosis. The membrane is partly made from silicon and overcomes several challenges of existing designs by tolerating the harsh conditions inside desalination plant equipment. The research has been published in the *Journal of Membrane Science*.

One practical problem of separation membranes is "biofouling", where biofilms form on the membrane surface. This slows the amount of water that can pass through the membrane. Sodium hypochlorite is commonly used to remove these biofilms; however, the chlorine can also damage the membrane.

Professor Tsuru, who is supported by CREST (Core Research for Evolutional Science and Technology) and is a member of the Center for Research on Environmentally Friendly Smart Materials at Hiroshima University's Institute of Engineering, said that the new membranes are

more robust, which makes them resistant to chlorine. They are also heat resistant, meaning they can be used in desalination at a temperature of 80°C.

"We are developing ROBUST membranes using three materials: silicon-based, hydrocarbon, and chemical vapor deposition. First we have developed silicon-based ROBUST membranes," Professor Tsuru said.

"We expect Japan to continue to be one of the leading countries in membrane technologies and membrane-treatment systems," he said.

Provided by Hiroshima University