

Electro-Responsive Hydrogels for a Facile Desalination

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The scarcity of potable water is one of the severe problems of the 21st century. Since more than a quarter of the world's population lives close to the ocean, the desalination of saline water has been considered as a possible solution of water scarcity.^[1] Several technologies for desalination are currently utilized including multi-stage flash(MSF) distillation, reverse osmosis(RO), and electrodialysis(ED),^[2] however these large-scale desalination technologies typically use large amounts of energy and highly sophisticated equipment, making those unsustainable in many regions.

Hydrogels are hydrophilic cross-linked polymers which have high capacity of absorbing and retaining water inside the structure. The cross-linked polymers in contact with liquid swell and form hydrogels due to the osmotic pressure difference between the inside of the gels and the surrounding liquid, so that hydrated ions (i.e. salt) in the liquid can be separated as hydrogels absorb water molecules.^[3] Furthermore, these cross-linked polymers can change their volume from swollen form to shrunken form in response to the repeated stimulation such as light irradiation^[4], electric field application^[5], pH change^[6], and temperature change.^[7] When the swelling of hydrogels are equilibrated, a certain amount of water inside of the gels can be released and recovered under the external stimulation.

Herein the synthetic methods of stimuli-responsive polymers, especially electro-responsive polymers, and their application to desalination which consumes much lower energy than the conventional desalination technologies will be introduced. The small-scale kit will be designed and presented in terms of point-of-use desalination.

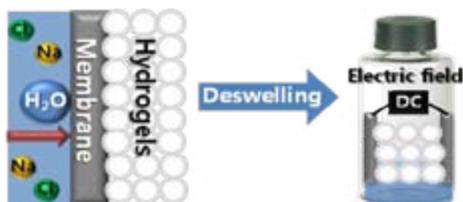


Figure 1 Schematic diagram of the application of stimuli-responsive hydrogels to desalination

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