Polymeric membranes for water reuse, seawater desalination and osmotic power generation

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Abstract

Clean water, clean energy, global warming and affordable healthcare are four major concerns globally resulting from clean water shortages, high fluctuations of oil prices, climate changes and high costs of healthcare. Clean water and public health are also highly related, while clean energy is essential for sustainable prosperity.

Among many potential solutions, advances in membrane technology are one of the most direct, effective and feasible approaches to solve these sophisticated issues. Membrane technology is a fully integrated science and engineering which consists of materials science and engineering, chemistry and chemical engineering, separation and purification phenomena, environmental science and sustainability, statistical mechanics-based molecular simulation, process and product design.

In this presentation, we will introduce our efforts on membrane development for water reuse, seawater desalination and osmotic power generation. In the beginning, we will introduce the basic science of hollow fiber fabrication, then talk about the ultrafiltration membrane development as a pre-treatment for seawater RO. After that, focuses will be shifted to nano-filtration, forward osmosis and osmotic power generation. Various material and fabrication strategies to enhance membrane performance will be discussed.