

## Membrane technology in seawater desalination: History, recent developments and future prospects

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### ABSTRACT

RO membrane technologies have achieved great progress in last 50 years. In seawater RO desalination field, energy saving and water quality improvement have always been two major subjects. Today, the energy consumption of RO membrane treatment process is one fifth and the operation cost is less than one tenth, compared to those of 1970's. However, innovative membranes are still demanded to achieve lower cost, lower energy consumption and lower impact to the global environment such as brine discharge, disposal of chemicals using in pretreatment processes and so on. In order to obtain further excellent performance, Toray has been executing basic research for RO membranes on focusing physical and chemical properties through PALS (Positron annihilation lifetime spectroscopy) study, TEM (transmission electron microscopy) analysis, etc. Accordingly, many innovative high performance RO membranes have been produced, and TM820R, which has achieved coexistence of high solute removal and high water permeability, has recently been released. Further study for effective use of high performance RO membranes which will be obtained near future to apply to the various temperature and salinity of feed water was also conducted. With considering recommended flux to avoid fouling, it was estimated that high flux membrane was suitable for low temperature and low salinity, and high rejection membrane was suitable for high temperature and high salinity. In this presentation, the prospects of attaining novel RO membranes including their histories and recent topics of desalination technologies will be introduced.

*Keywords:* Desalination; Energy saving; Reverse osmosis; Seawater; Water quality

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