

Novel membrane modifications for pressure retarded osmosis as a new way for sustainable power generation from salinity gradients

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Abstract

Pressure retarded osmosis (PRO) is a novel technology that allows power to be generated from high-salinity resources. To achieve a high power density, a high-salinity solution should be used on the draw side together with high hydraulic pressure, thus the PRO process requires a membrane that has high salt rejection and high pressure resistance. The reverse osmosis (RO) membranes can be potential candidates for the PRO process. In this study, commercial RO membranes with different surface modifications were examined: O₂ plasma, polydopamine (PDA) and tannic acid (TA). Improved water permeability and salt rejection were obtained after modification. The membranes were also tested with a high salinity solution (175 g/L NaCl) in a PRO mode. Due to the improved water permeability and high salt rejection of the surface-modified membrane, the commercial RO membrane showed enhanced power density (3 W/m²) in comparison to the pristine membrane (2 W/m²).