Thermally Enhanced Pressure Retarded Osmosis

We discuss how low-grade heat can be used to enhance the performance of pressure retarded osmosis (PRO) process. Heating feed and draw solutions has been previously shown to increase water permeate flux in both reverse osmosis and forward osmosis. Results suggest that pre-heating supply streams in PRO can significantly increase power density. When coupled to desalination as in RO-PRO, thermal enhancement can potentially yield both higher water production and lower power consumption. Experimental results are presented for water and reverse salt flux as a function of temperature. The effect of temperature on the ratio of PRO power output to thermal energy input is examined as an indicator for efficiency and cost effectiveness. Application of heat sources such as from low-grade waste from industrial processes (including at desalination plants), or from solar thermal energy in warm climates are discussed.