

Analysis of Power Generation Processes by Salinity Gradient: Pressure Retarded Osmosis (PRO) and Reverse Electrodialysis (RED)

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Seawater desalination has been considered as a breakthrough in water shortage problem. At the same time, high chemical potential energy induced by high salinity of seawater has become prominent. For example, when seawater comes in contact with river water of lower concentration, water or ion transport occurs by salinity gradient between two streams. This concept also can be used for post treatment of concentrated brine from seawater desalination because disposal of high salinity solution causes harmful influences on eco-system. There are two promising power generation processes: Pressure retarded osmosis (PRO) and Reverse electrodialysis (RED). In the PRO process, elevation of flow rate in a draw solution side by natural osmosis induces energy generation by hydroturbine. On the other hand, in the RED process, the migration of ions through ion exchange membranes produces potential differences, that is, electric potential energy. In this work, two power generation processes are analyzed and compared by modeling and simulation. By theoretical model development, effects of operating conditions for each process are studied.