

Review

Recent Advances in Osmotic Energy Generation via Pressure-Retarded Osmosis (PRO): A Review

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Abstract: Global energy consumption has been highly dependent on fossil fuels which cause severe climate change and, therefore, the exploration of new technologies to produce effective renewable energy plays an important role in the world. Pressure-retarded osmosis (PRO) is one of the promising candidates to reduce the reliance on fossil fuels by harnessing energy from the salinity gradient between seawater and fresh water. In PRO, water is transported through a semi-permeable membrane from a low-concentrated feed solution to a high-concentrated draw solution. The increased volumetric water flow then runs a hydro-turbine to generate power. PRO technology has rapidly improved in recent years; however, the commercial-scale PRO plant is yet to be developed. In this context, recent developments on the PRO process are reviewed in terms of mathematical models, membrane modules, process designs, numerical works, and fouling and cleaning. In addition, the research requirements to accelerate PRO commercialization are discussed. It is expected that this article can help comprehensively understand the PRO process and thereby provide essential information to activate further research and development.