

Buoyancy Effects in Pressure Retarded Osmosis with Extremely High Draw Solution Concentration

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Abstract : Water crisis is a world-wide problem because of population growth and climate change. Hence, desalination is a solution to water scarcity, which threatens the world. Reverse osmosis (RO) is the most used technique for desalination; unfortunately, this process, usually requires high-pressure requirement hence requires a lot of energy about 3 - 5.5 KWhr/m³ of electrical energy. The pressure requirements of RO can be alleviated by the use of PRO (pressure retarded osmosis) to drive the RO process. This paper proposes a process of utilizing the energy directly from PRO to drive an RO process. The paper mostly analyses the PRO process parameters such as cross-flow velocity, density, and buoyancy and how these have an effect on PRO hence ultimately the RO process. The experimental study of the PRO with various feed solution concentrations and cross-flow velocities at fixed applied pressure with different orientations of the PRO cell was performed. The study revealed that without cross-flow velocity, buoyancy effects were observed but not with cross-flow velocity.

Keywords : cross-flow velocity, pressure retarded osmosis, density, buoyancy

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