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TITLE: Recent Issues Relative to a Low Salinity Pressure-Retarded Osmosis Process and Suggested Technical Solutions

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ABSTRACT:

The cycle of occurrence of extreme weather event is getting shorter. To cope with this situation, various carbon abatement policies are being established, and related technologies are being studied. Naturally, no-carbon growth through sustainable energy generation is getting popular. One of such sustainable energy generating technologies is Pressure-retarded osmosis (PRO), which is a membrane-based energy generating process worked by salinity gradient. The very first PRO pilot plant was built by Statkraft in Norway. The pilot plant project checked the feasibility of the PRO plant, which we thought was theoretically possible, and acquired many meaningful results. However, it was found that a stand-alone PRO process is premature yet to be commercialized due to the economic constraints and environmental constraints of status quo. Consecutive to the challenge of Statkraft, various projects regarding PRO process have been conducted. Such projects specifically focused on solving the problems of economic and environmental constraints in PRO process by considering seawater and river composition, and geographical characteristics. To do so, the characteristics of a membrane process have been mainly considered to minimize the undesirable phenomena such as internal concentration polarization. In the same context, the pretreatment step of PRO process has been emphasized in PRO process, to get rid of the unwanted components of raw water. On the other hand, to raise the efficiency of energy generation, hybridization strategy also has been attempted. By hybridizing PRO process with Seawater Reverse Osmosis (SWRO), the energy generation efficiency of PRO process is enhanced excellently. In addition, geographical information system, a concept that includes osmotic power potential, seawater cycle, and physiochemical variables, can play an important role in selecting a process site. Although we have still a long way to go for the optimization of PRO process, PRO field can be a promising field, which can realize the truly eco-friendly and sustainable energy generation, if a long-term development is entailed.

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