Evaluation of FO membranes performance using a modelling approach

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ABSTRACT

Forward osmosis (FO) membranes development has made real progress over the last decade with a significant number of membranes reported in the literature. However, performances of these membranes are difficult to compare as diverse experimental conditions are used. In this study, the productivity of R&D FO membranes is predicted using a model by setting the same operating conditions, so that the water flux only depends on membranes intrinsic parameters. On this basis, a rigorous analysis of the obtained results is carried out. Membranes selectivity is discussed through the ratio of solute and water permeability coefficients. Results showed that the six best performing FO membranes in terms of water flux are thin-film composite (TFC) membranes of which four have polyvinylidene fluoride (PVDF) nanofibers support layers modified with hydrophilic materials. Advantages and limitations of different fabrication methods, membranes structures, morphologies and materials are discussed. Comparison with commercial FO membranes has also been carried out.

Keywords: Membranes developments; Desalination; FO membranes benchmark; Water and energy nexus; Forward osmosis.

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