

Comparison of the intrinsic parameters (A , B , and S) of a forward osmosis membrane using pressurized and non-pressurized methods

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ABSTRACT

Generally, forward osmosis (FO) membrane performance is defined based on its intrinsic parameters, namely the water permeability (A), solute permeability (B), and structural parameter (S). This study was conducted to examine the performance of the commercial membrane NF2 in an FO system and to validate and compare the intrinsic value of A , B , and S obtained by single stage-stage and two-stage methods. The NF2 membrane was unable to demonstrate a good configuration for an FO membrane due to its membrane structure. Comparing the two different orientations in the single-stage method, it appears that both orientations display distinct sets of intrinsic values for the same membrane type. A comparison on the two-stage methods between the pressure-retarded osmosis -FO and reverse osmosis (RO)-FO methods reveals a new standard for the two-stage methods where higher fluxes must be produced from the first stage in order to attain an accurate value of S at the second stage. Additionally, the RO-FO methods were found to be not relevant for testing the ability of a membrane for FO application due to the hydraulic pressure involved during the compaction procedure. The two-stage method with proposed new standards can be the ideal testing procedure for the membrane in FO applications. This is because all the intrinsic values can be separately determined considering all the possible concentration polarization that might occur with both orientations compared with the attempts of fitting all possible values in the generated equations, as in single-stage methods.

Keywords: Intrinsic parameters; Forward osmosis; Single-stage method; Two-stage method; Concentration polarization

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