Effect of multiple cations in the feed solution on the performance of forward osmosis

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Received 7 January 2014; Accepted 9 March 2014

ABSTRACT

In this study, different combinations of feed stream such as 0.2, 0.3 and 0.4 M of CaCl2 were, respectively, added with 1.0, 0.9 and 0.8 M of NaCl while maintaining the draw solution concentration at either 2.0 M of NaCl or CaCl2 in order to compare likely changes to the flux generated when the feed stream contained NaCl only. The results obtained showed that more constituents in feed stream generated lesser flux. Increase in CaCl2 concentration in feed stream resulted in more severe dilutive internal concentration polarisation (DICP) and hence, reduction in the performance ratio. The temperature and distribution of aggregated particle size also played a significant role in the overall performance of forward osmosis process. Further analysis showed that there is a relationship between the normalised driving force and flux behaviour which is governed by the effect of DICP. Additionally, the reflection coefficient was not unity as less than 2% traces of salt was found to permeate alongside with water towards the draw solution side.

Keywords: Dilutive internal concentration polarisation (DICP); Forward osmosis; Reflection coefficient; Salt aggregate; Water cluster; Water flux