

Multiple-solute salts as draw solution for osmotic concentration of succinate feed by forward osmosis

Yih Law, J.^{ab}, Mohammad, A.W.^a

Abstract

This study investigated the use of multiple-solute salts as potential draw solution (DS) for forward osmosis (FO) process. The novel concept of applying readily available waste byproducts as DS is briefly described in this paper. Two organic salts (sodium acetate and sodium formate) were used as draw solutes. The results indicated that the water flux performance was consistent with the osmotic pressure of the DS and that the binary-solute DS (each with 0.5 M concentration) was capable of achieving comparable water flux compared to the 1.0 M single-solute DS. Considering the variation of byproduct concentration during fermentation, a newly developed ternary-solute DS is introduced by employing NaCl additive. The physicochemical properties including osmotic pressure and viscosity were calculated by OLI Stream Analyzer software. Coupling these organic salts with NaCl demonstrated improvement of the DS including osmotic pressure and water flux. Succinate rejections of greater than 99% were obtained indicating insignificant succinate loss to the DS compartment. Although an increase of the reverse chloride flux was observed at increasing NaCl additive concentration, the acetate and formate ions demonstrated reduction of specific reverse solute flux attributed to higher water flux shown by ternary-solute DS. © 2017 The Korean Society of Industrial and Engineering Chemistry.

Author keywords

Forward osmosis, Multiple-solute draw solution, Organic salt, Osmotic pressure, Succinate transport