



## Using macromolecules as osmotically active compounds in osmosis followed by filtration (OF) system

S. Sarp<sup>a</sup>, S. Lee<sup>a</sup>, K. Park<sup>b</sup>, M. Park<sup>b</sup>, J.H. Kim<sup>a</sup>, J. Cho<sup>a,\*</sup>

<sup>a</sup>*Gwangju Institute of Science and Technology, School of Environmental Science and Engineering, Gwangju, Korea  
Tel. +82 62 715 2443; Fax: +82 62 715 2434; email: jwcho@gist.ac.kr*

<sup>b</sup>*Daewoo Institute of Construction Technology, Suwon, Gyeonggi-do, Korea*

Received 25 December 2011; Accepted 10 February 2012

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### ABSTRACT

Finding a suitable osmotically active solute is the most important problem in forward osmosis (FO). Even though there are a number of osmotically active compounds that exist, the major problem occurs during the separation of product water from the solute. Osmotically active macromolecules (polyethylene glycol [PEG] and humic acid [HA]) were investigated in this research as possible draw solutes for FO. Cellulose triacetate FO membranes (Hydration Technology Innovations, LLC) and several ultrafiltration and nanofiltration membranes were used in osmosis and filtration steps of the system, respectively. Molecular weights (MW) of PEG were selected as 2 k, 10 k, and 20 kDa for 400 and 600 g/L concentrations. HA solutions were prepared in concentrations ranging from 200 to 800 g/L. Increased MW resulted in higher water permeation when PEGs were used. The relationship between the reflection coefficient and the viscosity was investigated for PEG/water separation by membrane filtration. The combined effect of the osmotic pressure and the viscosity of the PEG solutions was found to be greater than the effect of the reflection coefficient on the permeability.

*Keywords:* Forward osmosis; Polyethylene glycol; Humic acid; Reflection coefficient; Viscosity; Osmotic pressure; Permeability

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\*Corresponding author.