

TETRABUTYLPHOSPHONIUM TRIFLUOROACETATE ($[P_{4444}]CF_3COO$) THERMO RESPONSIVE IONIC LIQUID AS A DRAW SOLUTION FOR FORWARD OSMOSIS PROCESS

(Larutan Ionik Responsif Haba Tetrabutylphosphonium Trifluoroacetate ($[P_{4444}]CF_3COO$)
Sebagai Larutan Penarik untuk Poses Osmosis Kehadapan)

Phang Sook Nyan, Syed M. Saufi *, Syamsul B. Abdullah, Mazrul N. Abu Seman, Malyanah Mohd Taib

*Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang,
Lebuhraya Tun Razak, 26300 Gambang, Pahang, Malaysia.*

*Corresponding author: smsaufi@ump.edu.my, Tel: 09-5492823, Fax: 09-549 2889

Highlights

- Tetrabutylphosphonium Trifluoroacetate ($[P_{4444}]CF_3COO$) was synthesized as a draw solution in forward osmosis
- $[P_{4444}]CF_3COO$ ionic liquid showed high water flux of 0.44 ± 0.007 LMH compared to the water flux of 0.32 ± 0.049 LMH for the sodium chloride (NaCl) draw solution at the same draw solution concentration

Abstract

Forward osmosis (FO) is recognized as a potential membrane technology that utilizes low energy for water desalination. It is driven by natural osmotic pressure difference between draw solution and feed solution across semipermeable membrane. Pure water will permeated from the salinity feed water to the draw solution side. In order to produce pure water, it is necessary to find the best draw solute that exhibits high draw ability and can separate the permeated water efficiently from the draw solution. In the current study, lower critical solution temperature (LCST) thermo-responsive ionic liquid (IL) of tetrabutylphosphonium trifluoroacetate ($[P_{4444}]CF_3COO$) was synthesized as the draw solution for FO process. $[P_{4444}]CF_3COO$ is dissolved in water below its critical temperature of $29^\circ C$ and becoming two layer above this critical temperature. $[P_{4444}]CF_3COO$ IL showed high water flux of 0.44 ± 0.007 LMH compared to the water flux of 0.32 ± 0.049 LMH for the sodium chloride (NaCl) draw solution at the same draw solution concentration. Applying thermo-responsive IL as draw solute in FO process has the potential to treat high salinity of feed stream with eases water recovery and draw solute regeneration.

Key words: Forward osmosis; draw solution, thermo-responsive ionic liqu