Fabrication of bilayer catalytic composite membrane PVA-SA/SPVA and application for ethyl acetate synthesis

Shutong Bo, Li Zhang, Shang Han, Yuewen Li, Weixing Li, Weihong Xing

www.elsevier.com/locate/memsci

PII: S0376-7388(18)30018-8
DOI: https://doi.org/10.1016/j.memsci.2018.05.047
Reference: MEMSCI16187

To appear in: *Journal of Membrane Science*

Received date: 25 January 2018
Revised date: 22 May 2018
Accepted date: 22 May 2018

Cite this article as: Shutong Bo, Li Zhang, Shang Han, Yuewen Li, Weixing Li and Weihong Xing, Fabrication of bilayer catalytic composite membrane PVA-SA/SPVA and application for ethyl acetate synthesis, *Journal of Membrane Science,* https://doi.org/10.1016/j.memsci.2018.05.047

Fabrication of bilayer catalytic composite membrane PVA-SA/SPVA and application for ethyl acetate synthesis

Shutong Bo, Li Zhang, Shang Han, Yuewen Li, Weixing Li*, Weihong Xing

State Key Laboratory of Materials–Oriented Chemical Engineering, College of Chemical Engineering, Nanjing Tech University, Nanjing 210009, China

wxli@njtech.edu.cn

Abstract

In this study, a dual-function catalytic composite membrane (CCM) was developed by coating a sulfonated-polyvinyl alcohol (SPVA) casting solution onto a polyvinyl alcohol (PVA)-sodium alginate (SA) membrane. SPVA was synthesized via sulfoisophthalic acid (SIPA) cross-linked PVA. The membranes were characterized by Fourier transform infrared spectroscopy (FTIR), thermogravimetry (TG), scanning electron microscopy (SEM), pervaporation and pervaporation coupled esterification experiments, etc. The dehydration of ethanol via pervaporation was studied over the concentration range of 3.5-11 wt% water in ethanol. The conversions of acetic acid in a batch reactor (BR) with CCM, pervaporation catalytic membrane reactor (PVCMR) with CCM and BR with free SIPA were compared. The experimental results showed that the conversion reached 96% in 12 h at 75 °C with 20% molar fraction of catalyst, an initial molar ratio (alcohol/acid) of 2:1 and an S/m ratio of 1.13 $cm^2 \cdot g^{-1}$ in PVCMR. With these conditions, the conversion was enhanced significantly by