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PII: S1385-8947(16)31441-3
DOI: http://dx.doi.org/10.1016/j.cej.2016.10.039
Reference: CEJ 15894

To appear in: *Chemical Engineering Journal*

Received Date: 26 March 2016
Revised Date: 3 October 2016
Accepted Date: 8 October 2016

Please cite this article as: A. Shameli, E. Ameri, Synthesis of cross-linked PVA membranes embedded with multi-wall carbon nanotubes and their application to esterification of acetic acid with methanol, *Chemical Engineering Journal* (2016), doi: http://dx.doi.org/10.1016/j.cej.2016.10.039

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Synthesis of cross-linked PVA membranes embedded with multi-wall carbon nanotubes and their application to esterification of acetic acid with methanol

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Abstract

The present study focused on the performance enhancement of cross-linked PVA membrane using citric acid as the cross-linking agent, and by incorporation of treated multi-wall carbon nanotubes (TCN). Hybrid membranes were synthesized and applied as a separation element in a membrane reactor to improve the esterification of acetic acid with methanol in which Amberlyst 15 was used as the catalyst. The properties of the membranes were investigated by Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, scanning electronic microscopy (SEM), transmission electron microscope (TEM), X-ray diffraction (XRD), thermal gravimetric analysis (TGA), derivative thermal gravimetry (DTG), differential scanning calorimetry (DSC), and tensile test. Moreover, swelling of prepared membranes at 25 °C was found for a quaternary feed solution. Results showed that the acid conversion rate was improved with the increasing TCN content of the membranes. It was also indicated that the hybrid membranes had good separating properties for removing water from the reaction mixture. The

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