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Crosslinked poly (ether block amide) composite membranes for organic solvent nanofiltration applications

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Abstract

Poly (ether block amide) - Pebax® - based membranes are well described for gas separation applications. But only a few publications exist for their application in pressure driven liquid applications like ultrafiltration and nanofiltration. Here we use the commercially available Pebax® 1657 for the preparation of membranes for the filtration of organic solvents. Porous polyacrylonitrile membranes were coated with Pebax® 1657 which was then crosslinked. Toluene diisocyanate (TDI) was used as a crosslinker agent for the coating. Reaction time and crosslinker concentration were optimized for the aimed application. The Pebax® coating and the impact of the TDI on the resulting crosslinked membranes were investigated by Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM) and differential scanning calorimetry (DSC). SEM analysis shows a uniform thin coating of the PEBAX that covers the pores of the PAN membranes. FTIR and DSC analysis confirm the crosslinking reaction. Crosslinked Pebax® membranes show high stability toward ethanol propanol, acetone and even dimethylformamide (DMF). In the case of DMF applications, the standard PAN was replaced by crosslinked PAN developed in our laboratory.

In order to increase the membranes permeances, graphene oxide (GO) nanosheets were incorporated in the Pebax® coating. These GO containing membranes showed strongly increased permeances for selected solvents.

Keywords: Pebax®, Poly (ether block amide), organic solvent nanofiltration, graphene oxide,

1. Introduction

Polymeric membranes found their way into conventional industrial separation processes, such as gas separation and water purification due to their mechanical robustness, structural diversity