



Preparation and permeability of PVDF membranes functionalized with graphene oxide

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ABSTRACT

The study described in this paper aimed to develop a technology for producing polymeric membranes containing carbon nanostructures. The membranes were laboratory produced using commercial graphene oxide (GO) purchased from Sigma-Aldrich, USA. Polyvinylidene fluoride (PVDF) with and without (GO) ultrafiltration (UF) membranes was prepared via phase inversion process. The membrane support layer was made of polysulfone. The active layer containing GO was produced either by a spraying or by a mixing method. Several parameters, such as a thickness, the largest pore size, and tensile strength, were determined for the produced membranes. The addition of 0.002 wt% GO by mixing provided the hydrophilicity increase, which was expressed by the decrease of the contact angle of the membrane. A decrease in the mass transfer resistance of the PVDF/GO membrane with respect to the reference membrane (without GO) was observed. The tests related to water and bovine serum albumin (BSA) permeability were carried out with the Osmonics Koch laboratory UF device. The water volumetric flux (for $\Delta P = 0.6$ MPa) through the membrane with GO disposed via spraying was lower (approaching $J_v = 0.02$ m³/(m² h)) than that of the membrane produced via mixing (approaching $J_v = 0.12$ m³/(m² h)). The former was almost the same as the one of the reference membrane. The retention coefficient for $\Delta P = 0.3$ – 0.6 MPa and 1 g/dm³ BSA solution was about 90%.

Keywords: Graphene oxide; Membrane composition; BSA; Ultrafiltration

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