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New chitosan/poly (acrylic acid) composite membrane for application in pervaporation dehydration of caprolactam solution

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ABSTRACT

To improve caprolactam pervaporation (PV) separation dehydration process, composite membrane was investigated using chitosan (CS) and poly (acrylic acid) (PAA) blending membrane as active layer and a polyacrylonitrile (PAN) ultrafiltration membrane as substrate. The composite membranes were characterized by FTIR, SEM, and XRD measurements to assess the intermolecular interactions membranes of morphology, and observe the crystallinity, respectively. The effect of the ratio of PAA and CS in the composite membranes on the PV performance was investigated. The flux was decreased and the separation factor was increased by the PAA content increase in the range of 10–30 wt.%. Besides, operating temperature and feed composition on PV performances were investigated. Data showed that PAA/CS composite membranes displayed good swelling and PV performance, and the composite membranes had superior separation performances for dehydration of ε-caprolactam solution, that the highest separation factor could reach 7,804 at 313 K, for 70 wt.% caprolactam. The evaluated results revealed that the separation performances of CS/PAA composite membranes were strongly related to their reaction degree and intrinsic structure as well as the operating parameters.

Keywords: Chitosan; Poly (acrylic acid); ε-Caprolactam; Pervaporation

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