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Influence of PVDF concentration on the morphology, surface roughness, crystalline structure, and filtration separation properties of semicrystalline phase inversion polymeric membranes

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ABSTRACT

This study was focused on the fabrication of nanoporous poly(vinylidene fluoride) (PVDF) membranes at different polymer concentration (14, 17, and 20 wt%) via phase inversion method. The morphology and surface roughness of the resulting membranes were investigated by scanning electron microscopy (SEM) and atomic force microscope, respectively. SEM results showed that with the increase of polymer concentration, the pore size of membranes and the overall porosity decrease. Also, the results showed that varying concentration results in significant changes on the surface roughness. Analysis of the crystalline structures of PVDF membranes by X-ray diffraction showed that the membranes, which precipitated in the higher concentration of polymer (20 wt%) had a typical "β" form of the crystalline phase, whereas those membranes that formed at lower concentration (14 wt%) showed crystallites of the "α + β" form of the crystalline phase. Furthermore, the filtration separation experiments of Acid Yellow 23 (AY23) were conducted to examine the effects of concentration parameter on the performance of nanoporous PVDF membranes. Results showed that the retention of AY23 increases as the polymer concentration increases and an efficiency of 89.72% was achieved in polymer concentration of 20 wt%.

Keywords: Poly(vinylidene fluoride); Phase inversion; Membrane; Filtration; Dye Removal

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