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Co-deposition integrating with interfacial polymerization to prepare PA/PDA/PVDF nanocomposite membrane and the application in the simulating RB5 dyeing wastewater treatment

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ABSTRACT

Polyamide (PA)/polydopamine (PDA)/poly(vinylidene fluoride) (PVDF) nanocomposite membranes were prepared by the method of dopamine (DA)/polyethyleneimine (PEI) co-deposition integrating with interfacial polymerization (IP) with trimesoyl chloride. Fourier transform infrared spectrometer, scanning electron microscopy, atomic force microscopy and water contact angle were used to characterize the PA/PDA/PVDF nanocomposite membranes. Effects of the co-deposition time, the mass ratio of DA to PEI, the molecular weight of PEI and the content of DA + PEI on the morphologies and roughness of the membrane surface, the cross-section of the selective layer and the performance of the PA/PDA/PVDF nanocomposite membranes were investigated. Results showed that the co-deposition time has significant effect on the rejection of PA/PDA/PVDF nanocomposite membranes, the other three factors have few effects on the rejection. All the four factors have remarkable effects on the permeation of the PA/PDA/PVDF nanocomposite membranes. When the rejection of PEG1000 and RB5 was 99%, the permeation of water and reactive black five (RB5) dyeing wastewater was 16.67 and 8.2 L m^{-2} h^{-1} bar^{-1}, respectively. The water flux and the RB5 dyeing wastewater permeation of the PA/PDA/PVDF nanocomposite membranes were 31.14 and 15.03 L m^{-2} h^{-1} bar^{-1}, respectively, when the PEG1000 and RB5 rejections were above 90%. Results above showed that the PA/PDA/PVDF nanocomposite membranes developed in this paper possess the potential application value in the dyeing wastewater treatment and reclamation

Keywords: PA/PDA/PVDF; Nanocomposite membranes; Co-deposition integrating with IP; DA/PEI; Dyeing reclamation

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