

PVDF/HMO ultrafiltration membrane for efficient oil/water separation

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ABSTRACT

In this research, hydrous manganese oxide (HMO) nanoparticles was adopted in polyvinylidene fluoride (PVDF) to improve the ability of the mixed matrix membrane (MMM) to separate oil/water emulsions. The MMMs – which were added with various amounts of HMO loading (3, 5, 7 and 10 wt%) – were characterized for its physicochemical properties, morphological structure, and nanoparticles dispersion of the PVDF/HMO membrane. Evidently, the presence of these nanoparticles increased the hydrophilicity and oleophobicity of the PVDF/HMO membrane as compared to those of the pristine PVDF. Concurrently, the water contact angle was reduced from 99° to 58° while oil contact angle increased from 0° to 35°. The presence of -OH groups and Mn element channeling the PVDF/HMO membrane wetting properties, which in turn improved the membrane's affinity towards water molecules and aversion to oil droplets. The PVDF/HMO membrane that contained 10 wt% of HMO loading exhibited a water flux (402 L/m² h) – 10 times greater than the pristine PVDF membrane with 93% oil rejection rate.

KEYWORDS

Hydrophilic membrane; Hydrous manganese oxide (HMO); Mixed matrix membrane (MMM); Oil/ water separation; Oily wastewater

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