

The Potential of Direct Contact Membrane Distillation for Industrial Textile Wastewater Treatment Using PVDF-Cloisite 15A Nanocomposite Membrane

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ABSTRACT

This work demonstrates the feasibility of employing direct contact membrane distillation (DCMD) for treating industrial textile wastewater for clean water production. Experimental results showed that the in-house fabricated polyvinylidene fluoride-Cloisite 15A polymer-inorganic nanocomposite membrane is robust and able to treat the industrial effluent by reducing at least 89% of the initial values of the water quality parameters measured. However, the membrane permeate flux was reported to decline almost 50% in the first few hours of the 40-h treatment process before reaching water flux of 13–22 kg/m² h. It is believed that the initial flux decline is mainly caused by the foulants accumulated on the membrane outer surface that increases mass transfer resistance of water molecules and reduces water productivity. With respect to separation characteristics, the DCMD process has shown better performance for COD and color removal in comparison to the other commonly used pressure-driven membrane processes. Further improvement on the membrane surface properties is necessary to reduce fouling propensity and pore wetting caused by the surfactants and other foulants in the textile wastewater. This is of particular importance for long-term operation of DCMD process.

KEYWORDS: Membrane distillation; Polymer-inorganic nanocomposite membrane; Textile wastewater; Membrane fouling; Pore wetting

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