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Novel hydrophilic and oleophobic hollow fiber membrane for effective and low fouling oil/water separation applications

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Membrane filtration for oil/water separation has the potential to provide a simple system with high separation efficiency for oily wastewater treatment. However, conventional membranes are usually subject to severe oil fouling, which has greatly limited the application of membrane technology in oily wastewater management so far. In this study, a novel hollow fiber membrane showing both hydrophilic and oleophobic surface properties was prepared and tested for its oil/water separation performance. The hollow fiber membrane was prepared from the popular conventional membrane material of polyvinylidene fluoride (PVDF) as the base material and a modified PVDF copolymer with hydrophilic and oleophobic segments as the additive (denoted as AP). The developed hollow fiber membrane was packed into membrane modules for the treatment of artificial oily wastewater samples prepared from hexadecane or crude oil emulsions and real oily wastewater samples collected from a palm oil mill in Malaysia. The experimental results indicate that, as compared to the control PVDF membrane and a modified PVDF membrane that had hydrophilic surface property, the developed novel hollow fiber membrane exhibited excellent performances: with much higher water flux, less flux decay during oily wastewater filtration, and significantly higher or almost complete flux recovery by a simple physical cleaning (e.g., water flushing or backwashing) after a filtration run, while achieved the same or usually higher oil removal efficiency. Since the hollow fiber membrane can be easily scaled up to the full module for practical use, there is a great prospect for the developed novel hollow fiber membrane to be used as an effective method for oily wastewater treatment.

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