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PVDF hollow fiber membraneswith different morphologies in direct-contact membrane distillation

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In this study, polyvinylidene fluoride (PVDF) hollow fibers with different morphologies have been fabricated via a dry-jet wet spinning process and tested for membrane distillation (MD). The effects of PVDF content and solvents, dimethylacetamide (DMAc) and triethylphosphate (TEP), on the morphology, pore structure geometry and MD performance were investigated. Phase separation mechanism of PVDF/additives/solvent systems was carefully studied via a phase diagram. Direct-contact membrane distillation (DCMD) for desalination was carried out to evaluate membrane permeability and salt rejection. A PVDF/polyethylene-glycol (PEG)/DMAc system produced a typical finger-sponge-finger-like structure in an instantaneous liquid-liquid (L-L) demixing, but an increase of PVDF content delayed the L-L phase separation, leading to a sponge-like cross-section. However, using TEP instead of DMAc, a bi-continuous morphology would be formed during crystallization. The hollow fibers fabricated from a PVDF/PEG/TEP system showed high permeability, long-term stability with big pores, high pore connectivity and narrow pore size distribution, potentially suitable for water and wastewater applications.

References

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