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Preparation of high strength poly(vinylidene fluoride) porous membranes with cellular structure via vapor-induced phase separation

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ABSTRACT

The preparation of poly(vinylidene fluoride) (PVDF) membranes with high mechanical strength via vapor-induced phase separation (VIPS) is still a great challenge. In this study, high strength PVDF membranes with cellular pore structure are successfully prepared by comprehensively regulating the process parameters such as the dissolution temperature (T_d), vapor temperature (T_v) and exposure time (t) during the VIPS process, as well as the membrane-forming parameter *i.e.* mass fraction of PVDF polymer. The effects of these parameters on microstructure and performances of the PVDF membranes are systematically investigated. In the investigated ranges of t from 0.67 min to 20 min, the membranes with cellular structure are obtained at both elevated T_d and T_v of 65 °C, relative humidity of 70%RH and mass fraction of 15 wt% PVDF. All the PVDF membranes with cellular structure prepared at elevated T_d and T_v of 65 °C exhibit high mechanical properties, and the tensile stress at break (σ^*) and tensile strain are higher than 2.5 MPa and 15%, respectively. The PVDF membrane prepared at t of 0.5 min has a critical structure and shows the maximum

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