

## Analysis of solidification rate of polymer solutions during PVDF membrane fabrication via TIPS method

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### ABSTRACT

It is necessary to know the solidification rate of the polymer solution when designing the membrane fabrication process. The effect of the composition of poly(vinylidene difluoride) (PVDF) solution on its solidification rate during membrane preparation via the thermally induced phase separation (TIPS) method was studied. Using time-dissolved light scattering, we observed that PVDF crystallized upon quenching in a water bath. With an increase in the concentration of PVDF in the solution, the solidification time decreased. Addition of glycerol to the solution was more effective in accelerating the solidification process during the TIPS process. Increase in the crystallization temperature of the PVDF solution was considered to be the reason for the above-mentioned observations. Since the difference between the crystallization temperature and water bath temperature is a driving force for crystallization, solutions with higher PVDF concentrations showed higher crystallization temperature, thereby showing faster solidification rates. The addition of glycerol also increased the crystallization temperature, owing to the transformation of the solid–liquid phase separation to the liquid–liquid phase separation, and the polymer-rich phase in which the polymer concentration was higher than that of the bulk solution appeared during the latter phase separation. The crystallization temperatures of the polymer solutions were observed to correlate well with the solidification time. Correlation curves of PVDF solutions with other diluents were also examined.

*Keywords:* Thermally induced phase separation; Solidification rate; Crystallization temperature; PVDF

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