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Solid-liquid phase separation of poly-4-methyl-1-pentene/diluent system via thermally induced phase separation

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ABSTRACT

Poly-4-methyl-1-pentene (PMP) microporous membranes were prepared via thermally induced phase separation (TIPS) with dioctyl adipate (DOA) as the diluent. Solid-liquid phase separation happened to this PMP/DOA system because of the weak interaction between them, which resulted in the spherulitic structure. Unique and obvious spherulites were formed at low PMP concentration system or low quenching temperature, while the spherulites were destroyed and impinged at high PMP concentration or high quenching temperature. Differential scanning calorimetry (DSC) and wide-angle X-ray diffraction (WAXD) were used to analyze the crystallization of PMP in the PMP/DOA system via TIPS. The increase of the PMP concentration delayed the crystallization of PMP, which was inferred from the results of both the isothermal and non-isothermal crystallization of the PMP/DOA system. The crystallization was faster and had more effect on the ultimate membrane morphology when the quenching temperature decreased. Double endotherm peaks emerged on DSC melting curves of PMP/DOA quenched samples were owing to the crystals of different extent formed in primary crystallization and further crystallization during TIPS.

Keywords: Thermally induced phase separation; Poly-4-methyl-1-pentene; Microporous membrane; Crystallization; Double endotherm peaks

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