

Effect of phase separation on crystallization and morphology of PP/EPR in-reactor alloys

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ABSTRACT

The effect of phase separation on crystallization and morphology of polypropylene/poly(ethylene-co-propylene) (PP/EPR) in-reactor alloys was investigated. The rate of phase separation was regulated by the molecular weight of the EPR component. For the alloy containing high molecular weight EPR, phase separation is slower, whereas faster phase separation is achieved in the alloy with low molecular weight EPR. Two thermal treatments were applied to the PP/EPR in-reactor alloys: (1) The samples were directly quenched from 230 °C to crystallization temperature (T_c) for isothermal crystallization; (2) The samples were firstly held at 180 °C for 60 min for phase separation and then cooled to T_c for crystallization. It is found that, when phase separation takes place faster, the pre-phase-separated sample crystallizes slower, as compared with the directly quenched one. Pre-phase separation in the melt also leads to more amorphous components included into the spherulites and thus a coarse spherulitic structure. In contrast, for the PP/EPR in-reactor alloy with a slower phase separation rate, pre-phase separation in the melt yields a reverse result. The pre-phase-separated alloy exhibits a faster crystallization rate than the directly quenched one and fewer amorphous components are included into the spherulites. These results were interpreted in terms of the upper critical solution temperature (UCST) type phase diagram of the PP/EPR in-reactor alloys.

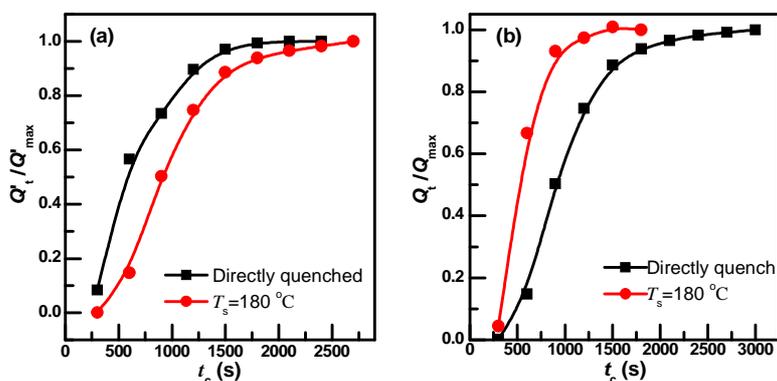


Fig. 1: Effect of phase separation on relative SAXS invariants of PP/EPR in-reactor alloys with faster (a) and slower (b) phase separation rate, respectively.

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References:

- ¹Li, Y.; Xu, J. T.; Dong, Q.; Fu, Z. S.; Fan, Z. Q. *Polymer* **2009**, *50*, 5134.
- ²Liu, Y. M.; Li, Y.; Xu, J. T.; Fu, Z. S.; Fan, Z. Q. *J. Appl. Polym. Sci.* **2012**, *123*, 535.