

AN ABSTRACT OF A THESIS

CRYSTALLIZATION OF POLY(ETHYLENE TEREPHTHALATE) AND POLY(BUTYLENE TEREPHTHALATE) IN POLYMER PROCESSING

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The blends composed of poly(ethylene terephthalate) (PET) and poly(butylene terephthalate) (PBT) were melt-mixed in both a cam mixer and an extruder with single screw. The rheological properties of blends were studied by a cone-and-plate viscometer and a capillary rheometer. Rheological data show that the melts of blends are Newtonian in the range of shear rate tested.

The glass transition and crystallization of the blends from glassy state and molten state were studied by DSC. The crystallization times were obtained in a wide range of temperature and the temperature, at which the crystallization rate reached a maximum, was obtained. It was found that entanglement of the chains of PET and PBT, transesterification, PBT content, and the molecular weights of PBT could significantly influence crystallization behavior of the PET component in the blends. It was also observed that there existed two kinds of motions in PET-PBT blends. One motion was caused by crystallization, which resulted in separation of the chains of PET and PBT in the blends. The other motion was caused by molecular diffusion, which resulted in a mixing process in the blends. Both of these two motions could also significantly influence crystallization behavior of the PET component in the blends.

The results obtained from the blends by extrusion showed that the crystallization behavior was strongly influenced by the time of the blends staying molten state during extrusion process. For extrusion process, there was a characteristic time, which was named as t_{limit} . The values of t_{limit} were strongly related to extrusion temperatures. When the residence times were larger than the characteristic time, t_{limit} , the crystallization behavior of the blends would be similar although these blends were made by much different extrusion speeds.

The value of t_{limit} can be obtained from experiments. This value can be used to explain experimental results on the crystallization behavior and to design the processing conditions in order to obtain desirable blends since the behavior of crystallization from glassy state is strongly related to the annealing behavior, which should be considered when an injection mold is used.

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AND POLY(BUTYLENE TEREPHTHALATE) BLENDS
IN POLYMER PROCESSING**

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