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BLOWN FILM OF LDPE/HDPE BLENDS. I. MISCIBILITY STUDY

Mohsen Mohammadi, Ali Akbar Yousefi, Morteza Ehsani,

Plastics, Iran Polymer and Petrochemical Institute

yousefi@icrc.ac.ir

Films of low-density and high-density polyethylene blend were obtained on a laboratory blown film line (Brabender Plasticorder) at various compositions. To investigate miscibility of the film blends with systematically variable composition, thermal analysis was employed. According to DSC thermal analysis, the overall picture of the miscibility/immiscibility in two ranges of blend composition was described. It was observable double melting peaks for the films of blends having more than 25% LDPE, which manifested organization of separated crystal phases. This supports immiscibility in solid state for these film blends. A film of 95% LDPE blend was an exception in which melting temperature of HDPE phase evidently shifted to lower temperature than that of neat HDPE film and partial miscibility was deduced. Nevertheless, for the films of blends with predominant fractions of HDPE, single melting peak affirmed presence of one population of crystallites as well as no segregation in crystalline phase. Subsequently they are judged to be miscible in solid state on the partial composition range. As the HDPE content in the films of blends decreases peak half-width of endotherm corresponding to HDPE phase becomes smaller, which indicates crystallite size distribution of HDPE phase gradually becomes narrower. Based on DSC and XRD measurements, the decrease of crystallinity resulted as LDPE content augment and it was not perfectly follow the additivity rule of mixtures. The lamella thickness corresponding to HDPE phase extends as the LDPE content reduces, and the biggest crystal size was revealed for neat HDPE film. However, blending showed no impact on the lamella thickness of LDPE phase in film blends.