OP-10-1102

Thursday, May 12, 2011, 05:00-05:20 pm
Room: Karam 2

CONTROL AND STABILIZATION OF MORPHOLOGIES IN IMMISCIBLE POLYMER BLENDS

A. Fabre[a,]*, L. Trouillet-Fonti[a,]*, S. Ceccia[a], P. Sotta[a,] *

[a] *Laboratoire Polymères et Matériaux Avancés, UMR5268 CNRS/Rhodia CRTL, 85 rue des Frères Perret BP62 69192 St Fons Cedex, France*

**Corresponding author: alexandra.fabre-exterieur@eu.rhodia.com, lise.trouillet-fonti@eu.rhodia.com, paul.sotta-exterieur@eu.rhodia.com*

The properties of immiscible polymer blends depend on morphology. Thus, a challenge is to obtain a controlled, reproducible and stable morphology, according to the desired set of properties. This study deals with the development and control of various morphologies (dispersed, stretched dispersed, fibrillar and co-continuous) in model immiscible polymer blends by reactive extrusion over a broad range of compositions.

Different formulations (PA6/HDPE/reactive compatibilizer blends of various composition and viscosity ratios) were processed using three different co-rotating twin screw extruders under various conditions. The morphologies obtained were characterized by Scanning Electron Microscopy (SEM) after selective dissolution of each phase. Viscosity ratios have less influence on the structures than expected from the models proposed in the literature. On the other hand, process parameters seem to have no influence on the morphology type, except at the boundaries between two different morphology domains. So, the composition is the predominant factor, which may suggest that the obtained morphologies may remain stable in a further processing step.

In a second step, the stability of the extruded blends morphologies with various compatibilizer amounts was studied during a second step processing and using model conditions in a capillary rheometer (controlled shear). The optimum compatibilizer amount needed to stabilize the morphologies was determined and the conditions for which the different morphologies are stable were evaluated.

As well as decreasing the size of the morphology and accelerating its development (as observed by sampling along the screw during twin screw extrusion), the compatibilizer amount has a direct influence on the morphology type, depending on its effect on the viscosity ratio. Finally, all morphology domains are summarized in ternary diagrams (PA6/HDPE/Compatibilizer) versus blend compositions, whatever the process used.