OP-3-96

Tuesday, May 10, 2011, 11:50am -12:10 pm
Room: Ministres

INFLUENCE OF INDUCED SHEAR ENERGY AND RESIDENCE TIME ON MATERIAL PROPERTIES OF POLYPROPYLENE NANOCOMPOSITES

A. Witschnigg[a*], S. Laske[a], I. Duretek[a], C. Holzer[a]

[a]*Department Polymer Engineering and Science, Chair of Polymer Processing, Montanuniversitaet Leoben,*

Otto Gloeckel-Strasse 2, 8700 Leoben, Austria

**Corresponding author: Andreas.Witschnigg@unileoben.ac.at*

The use of nanofillers (especially layered silicates) is steadily growing in polymer processing according to their great potential of enhancing specific material properties with a small amount of filler. In order to obtain this improvement, a homogenous dispersion of the nanofiller in the polymer must be achieved. The obtainable material improvement is in great extend depending on the particle distribution (agglomerated, intercalated or exfoliated) of the filler. The degree of dispersion is exceedingly linked with the shear energy induced in the polymeric material and the residence time used while processing nanocomposites. Using a co-rotating twin screw extruder for the production of nanocomposites the shear energy and residence time are depending in large extend on the type of screw, throughput and screw speed. The influence of the residence time and the amount of shear energy needed to create a sufficient degree of exfoliation is still not known precisely. This lack of knowledge is leading to only few industrial applications of layered silicates due to the fact that material properties obtained in labatory cannot be easily transferred in industrial or semi-industrial scale. Therefore it is of major interest and importance to find a processing ratio to ensure material quality and get optimized material properties. In this study the effect of different screws and screw speeds leading to different amounts of shear energy and residence time, on the dispersion of the silicate is investigated. Using the shear energy and the residence time a processing ratio is calculated to achieve a better comparison between the different nanocomposites. The differences in the degree of dispersion are compared via diverse methods such as tensile test, scratch test, impact penetration test as well as melt stiffness investigations. To determine the interparticular distance of the layers, as an indicator for the degree of exfoliation, SAXS measurements have also been realized.