OP-3-699

Friday, May 13, 2011, 11:10-11:30 am
Room: Ambassadeurs

Investigation of morphology and mechanical properties of rubber-toughened polyamide 6,6 nanocomposites

M. Roshanali[a], H. Garmabi[a,]*, A. Arefazar[a]

[a] *Department of Polymer Engineering and Color Technology, Amirkabir University of Technology, 424 Hafez Ave, Tehran, Iran.*

**Corresponding author: garmabi@aut.ac.ir*

Polymer nanocomposites containing a few percent of exfoliated layered silicates are materials with a unique weight/performance ratio. The only parameter that is not enhanced, but even decreased, is toughness. This work focused on the toughness enhancement of these systems with polyamide matrix. PA66/organoclay/rubber ternary nanocomposites were prepared using a lab-scale twin screw extruder. The effects of clay content, rubber content and rubber type on the morphology and mechanical properties of the nanocomposites were investigated. The rubbers used in this study were ethylene–propylene random copolymer grafted with maleic anhydride (EPR-g-MA), a random terpolymer of Ethylene Acrylic Ester and Maleic Anhydride (E-EA-MAH) and Styrene–ethylene/butylene–styrene triblock copolymer grafted with maleic anhydride (SEBS-g-MA). Response surface method was utilized to optimize the impact strength of polyamide 66 based nanocomposites.

The mechanical testes showed that, the combination incorporation of the organoclay as reinforcing filler and rubber as an impact modifier to PA66 matrix has led to ternary compounds where both the reinforcing effect of the organoclay and the toughening effect of the elastomer were observed. The best balanced mechanical properties was achieved using 12.5 wt % of SEBS-g-MA as toughener and 3.5 wt % of clay content, whereas 213% improvement in impact strength and 7.9% enhancement of Young's modulus was obtained compared with pristine polyamide 66 resin.

X-ray diffraction (XRD), transmission electron microscopy (TEM) and atomic force microscopy (AFM) revealed that semi-exfoliated and intercalated organoclay silicate layer structure was formed in rubber-toughened PA66 nanocomposites. Scanning electron microscopy (SEM) showed that the morphology of the rubber particles in the hybrid nanocomposite including SEBS-g-MA or E-EA-MAH as a toughener was more homogeneous, however, their particle sizes were smaller than those of the hybrid nanocomposite including EPR-g-MA as a toughener.