Contribution ID: **455** Type: **Poster**

Preparation and Investigation of Morphological and Thermal Properties of High-Density Polyethylene/SiO2 Nanocomposite Films

Tuesday, 16 April 2019 17:00 (2 hours)

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Nowadays polymer nanocomposites are materials of great commercial and economic importance. Especially, high-density polyethylene (HDPE) based nanocomposites. It exhibits a wide range of properties such as lightweight, chemical resistance, flexibility, toughness, good dielectric properties, thermal stability, electrical insulation, heat shrinkable properties, and relatively low cost compared with other plastics, which make it suitable for many applications [1, 2].
Nanocomposite samples of high density polyethylene matrix (HDPE+%SiO2) were obtained by thermal pressing (under a pressure of 15 MPa) at a temperature 165 ℃, followed by rapid cooling in water-ice system. As a filler it has been used an amorphous silica dioxide α-SiO2 (Sky Spring Nanomaterials, Inc. Houston, USA) with 20 nm size of spherical particles, specific surface area of S=160 m2/g and density of 2,65 g/sm3 [3].
Thermal and morphological properties of the nanocomposites were investigated using scanning electron microscopy (SEM), differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA).

Summary

The dispersion of SiO2 particles in the composites was studied by scanning electron microscopy (SEM). SEM results revealed that silica nanoparticles aggregates were in general distributed homogeneously. DSC results showed that the silica nanoparticles decrease the melting temperature of composite but increase the crystallization temperature, and lower the crystallinity degree of the HDPE. On the other hand, the homogenous distribution of silica particles in the HDPE significantly affected the thermo oxidative degradation of the composites.

The work was supported by the JINR-Romania Cooperation Programme Project of 21.05.2018 Order No. 323/92.

`References`

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Session Classification: Poster session