Preparation of conductive polymeric nanocomposites based on HDPE and Expanded Graphite

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In recent years, conducting polymer nanocomposites have attracted considerable attention because of their potential applications in advanced technologies, for example, in light emitting devices, batteries, electromagnetic shielding, anti-static, corrosion resistant coatings, and other functional applications. The introduction of electrically conductive fillers such as graphite, carbon black, metal and metal oxide powders into the polymeric matrix is a promising approach to fabricate electrically conductive polymeric materials. The recent advancement of nano-scale compounding technique enables the preparation of highly electrically conductive polymeric nanocomposites with low loading of conductive fillers. Nanocomposites may offer enhanced physical features such as increased stiffness, strength, barrier properties and heat resistance, without loss of impact strength in a very broad range of common synthetic or natural polymers.

In this study the conductive fillers was expanded graphite (EG), (Fig. 1), the base material was high density polyethylene (HDPE). Nanocomposites containing up to 22 volume % of EG filler material were prepared by mixing them in a Brabender Plasticorder at 200°C for 10 minutes.

The variation of the electrical conductivity of composites versus the content of EG is shown in Fig. 2. The introduction of EG significantly improved the conductivity of HDPE with a sharp transition from an electrical insulator to an electrical semiconductor. The notable improvement of electrical conductivity of composites resulted from the formation of the conductive network of EG within HDPE matrix. The percolation threshold was at 10 weight percent for HDPE/EG nanocomposites, corresponds to the onset of transition from an insulator to a semiconductor.

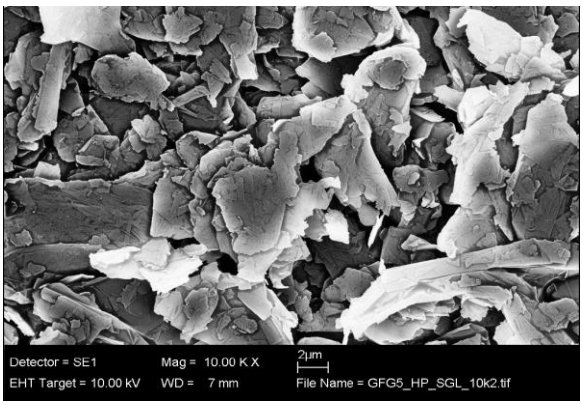

Fig. 1. SEM image of EG

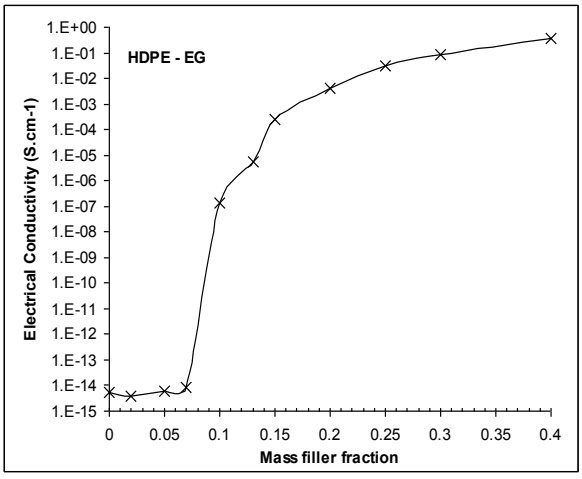

Fig. 2. Electrical conductivity of HDPE/EG.

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