New Processing Technique To Improve Physical And Mechanical Properties Of Graphene Nanocomposites

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Abstract

Nanocomposites are commonly used in many applications and new processing techniques are required to improve mechanical and physical properties of these materials. Graphene nanoplatelets (GNPs) have high aspect ratio and can maximize stress transfer in the composite. GNPs were added to linear low density polyethylene (LLDPE) at different weight percentage and different feeding and extruder speeds. 1,2,4,6,8 and 10% of graphene nanoplateletes loading were used for preparing the composites. Extruder and feeder speed were 50rpm,100rpm and 150 rpm. Higher content of GNPs and higher speed slightly improved crystallinity temperature due to the reduction of the agglomerates at higher speed and easy production of nucleation zones. Higher speeds improved the thermal degradation temperature as new barrier layers are formed and increase in thermal and electrical conductivity due to the good distribution of the fillers in the polymer matrix. Increase by 48% of tensile testing was achieved with the highest speed and 4% addition of GNPs. This enhancement in mechanical, thermal and electrical properties of GNPs/LLDPE nanocomposites achieved at high extruder speed with GNPs via melt mixing can open the door to industrial manufacturing of economical novel materials with superior tensile strength, thermal stability and electrical conductivity.