THERMAL PROCESSES OF ABLATION CHARACTERISTICS OF SWCNTs / (PP – HDPE) BLEND NANOCOMPOSITES: EMPIRICAL AND SIMULATION INVESTIGATIONS

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ABSTRACT

Effect of reinforcement of single well carbon nanotubes (SWCNTs) on thermal processes characteristics of polypropylene (PP) – high density polyethylene (HDPE) blend based nanocomposites in terms of empirical and simulation approaches were investigated. Extrusion and hot - press techniques were used after pre auxiliary procedures to prepare the blend and nanocomposites specimens. Thermal tests included thermal conductivity by using Lee's disc and ablation rate as well as thermal insulator index by using oxy-acetylene flame techniques. Simulation programs of heat transfer in three dimensions for ablation test of PP – HDPE blend nanocomposites specimens were carried out using finite difference method.

Thermal conductivity results show that the values increase progressively by increasing of volume fraction of SWCNTs. Simulation results prove that when the SWCNTs are parallel to heat flow, thermal conductivity values reached higher than that of random and perpendicular direction respectively. Ablation rate behaves inversely, where it drops at high volume fraction of SWCNTs; than blend was alone. Ablation results of experimental work and theoretical simulation were compared to understand the nature of adhesion mechanism between components of nanocomposite material. This comparison included the variation of the above measured and calculated properties in different volume fraction and different orientation of the SWCNTs.

KEYWORDS: Ablation, Blend, Nanocomposites, Simulation, Thermal Conductivity