

MECHANICAL AND PHYSICAL PROPERTIES OF HIGH DENSITY POLYETHYLENE FILLED WITH CARBON BLACK AND TITANIUM DIOXIDE

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ABSTRACT:- In this work composite material composed of high density polyethylene and inorganic pigment (carbon black and titanium dioxide) was prepared. Different amounts of carbon black and titanium dioxide (2– 15) wt% were added as filler. The preparation of filled and unfilled (High density polyethylene /Carbon black and titanium dioxide) composite was carried out using a single – screw extruder operated at a temperature of (170 – 190)°C. The incorporation was performed in a single screw extruder and sheets specimens were obtained by hot compression from extruded materials.

Many mechanical and physical tests were used to determine the properties of the prepared composite material which involved compression strength, impact strength and modulus of elasticity for all the preparation composite. An untreated HDPE sheet is used for the purpose of comparison. In this study, the influence of addition of Carbon black and titanium dioxide, on the mechanical ,electrical and thermal a properties test of high-density polyethylene (HDPE). The results show that the use of pigments, carbon black and TiO₂ in appropriate concentration ratios give a reliable improvement in the mechanical properties. The weight fraction of the carbon blacks and titanium dioxide ranged from 0.0 up to 15 wt % with the high density polyethylene. By discharging a high voltage through the composite it was found that the resistivity of the composite decreased. Carbon black and titanium dioxide –high-density polyethylene composites show significant differences from the neat high-density polyethylene measured in the frequency range.

It was found that the carbon black and titanium dioxide/ high-density polyethylene composites have better thermal properties than the neat high-density polyethylene.

Keyword: high density polyethylene. Titanium dioxide, Carbon black, Electrical properties, Thermal conductivity, Mechanical properties

1- INTRODUCTION

During the last years a considerable effort has been devoted to improve the properties and quality of the composite materials to meet engineering requirements. Various technical demands of the modern technology of such materials depend on their structure and physical and mechanical behavior. The characterization of such composite materials needs knowledge of a number of physical parameters. However, for a two-phase composite material, the electrical and mechanical behavior depends on both the type and weight fraction of the filler and the matrix and their interaction. Additives for polymer composites have been variously classified as reinforcements, fillers or reinforcing fillers. Reinforcements, being much stiffer and strong than the polymer, usually increase its modulus and strength ⁽¹⁾. The primary reasons for using additives are: property modification or enhancement; overall cost reduction; improving and controlling of processing characteristics. Important types of modified polymer