AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
DESIGN AND PRODUCTION ENGINEERING DEPARTMENT

Mechanical and Physical Behavior of Marble and Granite Dust with Polyethylene and Polypropylene Composite

A Thesis Submitted In Partial Fulfillment of the Requirement of the Degree of Master of Science in Mechanical Engineering

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Statement

This thesis is submitted in partial fulfillment of Master of Science degree in mechanical engineering, Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of this thesis has been submitted for a degree or qualification at any other scientific entity.

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Thesis Summary

The properties of polypropylene (PP) and high density polyethylene (HDPE) reinforced with marble and granite dust particles was investigated.

In this work, particle shape, thermal analysis and chemical composition of the marble and granite dust were determined.

The effect of marble and granite dust particles content on the mechanical and physical properties of the composites was obtained at 10, 20, 30, 40, 50, 60 and 70 weight percentage. Also, the effect of the dust particle size on the properties 37, 387, 450 and 1350μm was obtained. The fracture surface of the tested specimens was studied using scanning electron microscopy (SEM).

Key words: Marble and granite dust, Polymer, Polymeric composites, thermal analysis, chemical composition, physical analysis, mechanical properties, scanning electron microscope.

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List of Abbreviations

AAS	Atomic absorption spectroscopy
ASTM	American Society for Testing and Materials
CTE	Coefficient of Thermal Expansion
DSC	Differential Scanning Calorimetry
DTA	Differential Thermal Analysis
DTG	Derivative Thermogravimetric Analysis
EDX	Energy-Dispersive X-Ray Microanalysis
EPRI	Egyptian Petroleum Research Institute
FTIR	Fourier Transform Infrared Spectroscopy
HDPE	High Density Polyethylene
JCPDS	Joint Committee on Powder Diffraction Standards
LOI	Lost on Ignition
M&G	Marble and Granite
NRC	National Research Centre
PP	Polypropylene
SEM	Scanning Electron Microscope
STA	Simultaneous Thermal Analysis
STCE	Science and Technology Center of Excellence
T_m	Melting temperature
TGA	Thermal Gravimetric Analysis
TMA	Thermomechanical Analysis
X_r	Crystallinity
XRD	X-Ray Powder Diffraction
XRF	X-ray Fluorescence
ΔH^*	Heat flow of the sample

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