DEVELOPING A NOVEL GEOPOLYMER USING MARBLE DUST

By

Bsma Abdalla Abdelgadir Osman

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
Structural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

Prof. Dr. Osama Abd EL-Ghafour Hodhod

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Title of Thesis:

Developing A novel Geopolymer Using Marble Dust

Key Words:
Marble dust; silica fume; fly ash; geopolymer paste.

Summary:

The thesis covers the study of the effect of marble dust on the properties of the geopolymer paste .The use of marble dust, fly ash and silica fume in different percentage with alkaline activator were used to study the mechanical properties (compressive strength , flexural strength and tensile strength) and durability (water absorption) of geopolymer paste .The results showed that the highest compressive strength (237.8 Kg/cm^2)was obtained when using 70% of fly ash and 30% of the marble dust and w/b = 28% . In addition , it was observed that the use of w/b ratio = 0.28 in the formation of geopolymer paste containing 90% fly ash and 10% marble dust gave the highest value of the ultimate flexural load (245 kg). The highest value of tensile strength(14.9 Kg/cm^2) was obtained when using the percentages of (45% , 45% , 10%) for fly ash , marble dust , and silica fume , respectively when w/b ratio = 33%.In addition, the results were verified by SEM imaging.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Date:

Signature:

Dedication

To my...

Father,

Mother,

Brothers and Sisters

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The author wishes to express sincere appreciation to her major advisor, **Prof. Dr. Osama Abd EL-Ghafour Hodhod** professor of strength and testing materials, Faculty of Engineering, Cairo University .I have been very interested in his scientific, academic and practical support at all stages, enabling me to carry out all the requirements of scientific research, and his cooperation has a great effect in removing all the obstacles that had faced me.

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Nomenclature

Addition, ADD.

Aggregate, Agg.

Alkaline Activator Solution, AAS

Aluminum, Al

Aluminum Oxide, Al_2O_3

Calcium, Ca

Calcium Carbonate, Ca Co_3

Calcium Oxide, CaO

Aluminum, Al

Aluminum Oxide, Al_2O_3

American Society of Testing and Methods, ASTM

Marble Dust, MD

Fly Ash, FA

Silica Fume, SF

Loss on Ignition %, LOI

Compressive Strength, F_c

Tensile Strength, T

Flexural Ultimate Load, FUL

Centimeter, cm

Chloride, Cl

Degree Celsius, °C

Geo-polymer Concrete, GPC

Gram, gm

Gram per square centimeter, g/cm^2

Ground granulated blast furnace slag, GGBFS

Iron oxide, Fe_2O_3