INFLUENCE OF THERMAL TREATMENT OF CEMENT KILN DUST ON THE REACTIVITY OF GEOPOLYMER SLAG BASED COMPOSITES

By

Rania Samy Saleh Abdel-Aziz Abdullah

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

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Title of Thesis:

Influence of thermal treatment of cement kiln dust on the reactivity of geopolymer slag-based composites

Key Words:
Thermal treatment; CKD; Slag; Geopolymer Composites; Eco-Friendly

Summary:

In this research the influence of thermal treatment of cement kiln dust on the reactivity of geopolymer slag-based composites was studied. Three different sources of CKD were used. For each CKD source, two thermal treatment temperatures were investigated (700 & 800 ˚C). three different water to binder ratios 12%, 16% and 20% were investigated. Three curing regimes; ambient temperature, oven curing and microwave were tested and investigated. The compressive strength was measured and SEM and EDX techniques were carried out in order to interpret the results.

Disclaimer

I hereby declare that 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 beloved husband, Tarek
Thank you for your love, kind support and help.
I really appreciate.

To my father's soul,
Who always supported me, whatever path I took,
I will always remember the things you have taught me and how much you love me.

To my mother,
Who always encourage me to go on,
Thank you for your love and care.

To my beloved sons, Abdul-Rahman, Yassin and Aly
Your smile brightens up my world
I wish you all the best and happiness in life.

To all my family and friends,
without whom none of my success would be possible.

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finally, I express my gratitude to my family for providing me with support and encouragement throughout my years of study and through the process of researching and writing this thesis.

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Nomenclature

Al_2O_3, Aluminum Oxide

BFSC, blast furnace slag cement

CaO, Calcium Oxide

C-S-H, calcium silicate hydrate

^oC, Celsius scale

Cl, Chloride

CKD, Cement Kiln Dust

EDX, Energy Dispersive X-ray Analyses

F_2O_3, Iron Oxide

GGBFS, Ground Granulated Blast Furnace Slag

GPC, Geopolymer concrete

K_2O, Potassium Oxide

Kg, Kilogram

Kg/cm^2, Kilogram per square centimeter

LOI, Loss on ignition

MgO, Magnesium Oxide

MnO, Manganese Oxide

NaOH, Sodium Hydroxide

Na_2SiO_3, Sodium Silicate

Na_2O, Sodium Oxide

NOX, Nitrogen Oxide

OPC, Ordinary Portland Cement

P_2O_5, Phosphorus pentoxide

PH, Scale of alkalinity

SEM, Scanning Electronic Microscope

SiO_2, Silicon Dioxide

SO3, Sulfur Trioxide

SOX, Sulphur Oxides

TiO2, Titanium Dioxide

XRF, X-Ray fluorescence