PROPERTIES OF CEMENTITIOUS COMPOSITES INCORPORATING DIFFERENT NANO MATERIALS

By

Mohamed Samir Ali Khalfalla

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

in

STRUCTURAL ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

PROPERTIES OF CEMENTITIOUS COMPOSITES INCORPORATING DIFFERENT NANO MATERIALS

Key Words:
Cementitious Composite; Nano Silica; Nano Titanium; Carbon Nano Tube; Abaqus

Summary:
The Investigation of cementations composites incorporating nano materials such as, Nano Silica (NS), Nano Titanium (NT), and Carbon Nano Tube (CNT) on the different cement paste/mortar/concrete characteristics is the main purpose of this thesis. The cement paste incorporating NS, takes an important role in generating C-S-H. A 6% replacement achieves the best proportion where increasing both compression and flexure strengths by 42% and 50% respectively, while hydration process increases up to 16% as well. A 1% CNT cement replacement in mortar achieves mechanical characteristics improvement by about 27% in compression and 6% in flexure, while porosity is improved by 30%. A 0.04% CNT cement replacement in concrete achieves 42% improvement in compression under normal condition, and 36% in indirect tensile strength under normal and fire conditions respectively. Furthermore, numerical analysis using (ABAQUS) is conducted to study the strengthening effect of cracked concrete beam using epoxy resin incorporating CNT.

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DEDICATION

To my parent, my wife, my son, and my daughter

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