



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم



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# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



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Cairo University

# **THE EFFECT OF USING NANOMATERIALS ON THE DURABILITY OF CONCRETE**

By

**Marium Mohamed Fathi Mohamed Mahmoud Eid**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
in Partial Fulfillment of the  
Requirements for the Degree of  
**INTERDISCIPLINARY-MASTER OF SCIENCE**  
in  
**Advanced Materials and Nano-Materials**

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THE EFFECT OF USING NANOMATERIALS ON THE DURABILITY OF  
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**Key Words:**

Nano materials; Nano Bentonite; Nano Kaoline; Permeability; Scanning Electron  
Microscope analysis

**Summary:**

This research aims to study the effect of adding nano-materials on the durability of concrete through a laboratory program. Nano bentonite and nano kaoline were used and a mixture between them as a partial substitute for cement with different ratios and then measuring the properties of concrete that have the most impact on its durability over time, the permeability and resistance to exposure to aggressive media like concentrated sulfuric acid. The results showed that the highest percentage of improvement in most of the properties of concrete was obtained when using a mixture of nano kaoline with nano bentonite at 12% of the weight of cement materials followed by nano bentonite and the optimum percentage is 15%.





## **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: Mariam Mohamed Fathi Mohamed Mahmoud Eid

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## **Dedication**

In the loving memory of my beloved Dad **Professor Dr. Fathi Eid** (may his soul rest in peace)

To my amazing Mother **Dr. Samia Emera** who always brighten my life.

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