



NANOMATERIALS IN BUILDING ENVELOPES AND ENERGY SAVING IN THE CLIMATE OF CAIRO

By

Ather Fayek Bassiouny

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
Architectural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis : **Nanomaterials in Building Envelopes and Energy Saving in the Climate of Cairo**

Key Words: Nanotechnology, energy-saving, nanomaterials, building materials, green architecture

Summary :

This thesis studies nanomaterials in the building envelope, how they can help save energy in buildings in Cairo, and the effect of weathering on their performance. The theoretical part uses the inductive analytical approach. The empirical part proposes a methodology for studying the energy performance of nanomaterials and the effect of the climate of Cairo upon this performance, proposing and testing treatments to increase their resistance to these climatic conditions. The methodology was empirically applied. Certain nanomaterials were used in a simple model, and their energy performance was analyzed using energy simulation, and compared to the energy performance of the same model with conventional materials. An accelerated weathering test was conducted for a selected nanomaterial. The study concludes that the selected nanomaterials can cause a significant energy saving, except for the insulating nanocoating, and the material tested by the accelerated weathering test was nearly unaffected.

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To my beloved Mother and Father
For their continuous help and support year after year
until I could finally accomplish this work
And
To my beloved wife
I dedicate this work

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