شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

NANOTECHNOLOGY AS A TOOL FOR DESIGNING ENERGY EFFICIENT BUILDING

By

Sarah Gamal Saleh Mohamed

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
Architectural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2021

NANOTECHNOLOGY AS A TOOL FOR DESIGNING ENERGY EFFICIENT BUILDING

By
Sarah Gamal Saleh Mohamed

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
Architectural Engineering

Under the Supervision of

Prof. Dr. Ahmed Ahmed Fikry
……..
Professor of Architecture and Environmental Design
Architecture Department
Faculty of Engineering, Cairo University

Assoc. Prof. Dr. Reham Eldessuky Hamed
……..
Associate Professor of Architecture and Environmental Design
Architecture Department
Faculty of Engineering, Beni-Suef University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2021

NANOTECHNOLOGY AS A TOOL FOR DESIGNING ENERGY EFFICIENT BUILDING

By
Sarah Gamal Saleh Mohamed

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
Architectural Engineering

Approved by the
Examining Committee

_____

Prof. Dr. Ahmed Ahmed Fikry, Thesis Main Advisor
Professor of Architecture and Environmental Design, Architecture Department, Faculty of Engineering, Cairo University

_____

Assoc. Prof. Dr. Reham El-Dessuky Hamed, Advisor
Associate Professor of Architecture and Environmental Design, Architecture Department, Faculty of Engineering, Beni-Suef University

_____

Prof. Dr. Ayman Hassaan Mahmoud, Internal examiner
Professor of Architecture and Environmental Design, Architecture Department, Faculty of Engineering, Cairo University

_____

Prof. Dr.Magda Ekram Ebeid, External examiner
Professor of Architecture, Faculty of Environmental Studies and Research, Ain Shams University and Dean of the El Obour High Institute for Engineering and Technology

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2021

Engineer's Name: Sarah Gamal Saleh Mohamed
Date of Birth: 30/7/1986
Nationality: Egyptian
E-mail: Arch.sara307@gmail.com
Phone: 01222338090
Address: 5A Soliman Abaza street, El-Zaytoun
, Cairo Governorate
Registration Date: 1/10/2011
Awarding Date: / /2021
Degree: Master of Science
Department: Architectural Engineering
Supervisors:
Prof. Dr Ahmed Ahmed Fikry
Assoc. Prof. Dr. Reham El-Dessuky Hamed
Examiners:
Prof. Dr. Ahmed Ahmed Fikry (Thesis main advisor)
Assoc. Prof. Dr. Reham El-Dessuky Hamed (advisor)
Faculty of Engineering, Beni-Suef University
Prof. Dr. Ayman Hassaan Mahmoud (Internal examiner)
Prof. Dr.Magda Ekram Ebeid (External examiner)
Faculty of Environmental Studies and Research- Ain Shams University and Dean of the El Obour High Institute for Engineering and Technology

Title of Thesis:
Nanotechnology as a Tool for Designing Energy Efficient Building

Key Words:
Nanotechnology; Residential building; Energy consumption; Energy efficient Building; Building envelope.

Summary:

The world has witnessed many crises, including the energy crisis, since the 1970s. This critical crisis draws attention and requires a rapid solution. It found that the main axis of the emergence of this crisis is the residential buildings because it consumes 42.45% of energy source due to the urban expansion energy consumer. Hence, we start towards energy-efficient buildings designed to reduce energy consumption and provide thermal comfort within the building. This trend led to emerging of several solutions using conventional and modern technology applications (including nanotechnology).

Therefore, this thesis aims to highlight both the conventional and nanotechnology applications and study the extent of their impact on the building's energy efficiency. The research indicates the use of nanotechnology applications contributes to enhanced thermal performance and rationalize energy consumption more effective than conventional application (currently used). It will also provide solutions to architectural problems in building and construction.

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 reference section.

Name: Sarah Gamal Saleh Mohamed Date: / /2021

Signature:

Dedication

I dedicate my master thesis to:

My beloved parents, Ms. Nadia Mahmoud and Mr. Gamal Saleh, My first gift and my candle that illuminates my way, who have taught me to stand in front the waves of the rebellious sea, To whom they have given me and to whom they still give me without limits, To those who have lifted up my head high and proud of them. And if my pen`s ink does not express my feelings towards them, my thoughts are greater than being on paper. But I do not have except I call Allah Almighty for protecting them and not deprive us of springs of their love and affection. The most precious treasure I Possess.

My brother, Dr. Amr Gamal who has always been for me and loved me unconditionally.

My lovely husband, Mr. Khaled Ismail, has provided continued patience, love, friendship, humor, and understanding while I spent hours in this research. Also, he has been a constant source of support and encouragement during the challenges of life.

My little girl, Nour Khaled, was born during my research. She has made me stronger, better, and more fulfilled than I could have ever imagined. I love you to the moon and back.

My faithful friend, Reham Saad, who I considered as my sister which my mother did not bear her.

My lovers of my family.

In particular, Professor Dr. Ghada Fahmy, Dr. Yousef El-Gendy, and Dr. Bassem Kandel, all those who taught me and lit a science candle in my life, candles that burn to light the way of others.

All those who are offering me a helping hand. Anyone who sees this humble effort as a reader or a science student.

All of them, I dedicate the result of my humble effort, calling on Allah Almighty to make it a useful note and a receptive work in my balance of good deeds.

Acknowledgments

In the Name of Allah, the Most Gracious, the Most Merciful.

And say, "Do [as you will], for Allah will see your deeds, and [so, will] His Messenger and the believers. And you will return to the Knower of the unseen and the witnessed, and He will inform you of what you used to do." (105) Surah At-Tawbah.

The great truth of Allah

O Lord, to you, is praise as befits the glory of your face and the greatness of your might. I thank my Lord and repent to you. I pray and peace on the Prophet Mohammed Bin Abdullah the best prayer and completed peace and on his family and his companions (friends) altogether. After.

First, I thank Allah the most gracious and the most merciful for helping me and giving me the strength to accomplish this master's degree in Cairo University - Faculty of Engineering - Department of Architecture - Building Science and Technology.

I would like to extend my sincere gratitude and thankfulness to Professor Dr. Ahmed Ahmed Fikry, Professor of Architecture and Environmental Design, Architecture Department, Faculty of Engineering, Cairo University, for encouragement, guidance, patience, motivation, enthusiasm, and valuable opinion. I ask Allah to make every effort, advice, and encouragement in his balance of good deeds. Thanks and prayers are also attached to Associate Professor Dr. Reham El-Dessuky Hamed, Associate Professor of Architecture and Environmental Design, Architecture Department, Faculty of Engineering, Beni-Suef University.

I would also like to express my gratitude to the members of my examination committee; Professor Dr. Magda Ekram Ebeid, and Professor Dr. Ayman Hassaan Mahmoud for their appreciation for discussing my thesis, and for their motivation, informative suggestions, challenging questions, and advice to carry it out in the best form. I ask Allah to reward them for their good deeds and do their job in the balance of their good deeds.

I would also like to thank my parents: My kind mother, Mrs. Nadia Mahmoud that made me be as I am now, taught me a lot (patience, not giving up, self-confidence and my abilities, follow up on my dreams and goals, etc.) she stood beside me and supported me to complete my thesis. Dedication to this thesis is not enough to thank her, and I would like to pay my life to see her face smiling, and my dear father, Mr. Gamal Saleh who I carry his name and for him, a love, respect, and appreciation. he had a helping hand in getting this thesis out. I ask Allah to extend their age to see the fruit that has come harvested after a long wait.

I would also like to extend my thankfulness to my husband, Mr. Khaled that supported me with his motivational words and encouraged me to continue my academic career. He tolerates my mood swings. Without him, I could not do anything.

I thank everyone who encouraged me and helped me complete this thesis. I especially mention the sister and friend Hager Said El-Desouky this is the least I can offer.

Finally, I hope from Allah that I have been able to prepare this thesis in a manner that benefits Islam and Muslims, serves students, and receives Allah's satisfaction.

Table of Contents