

High-performance envelopes aim to save building's interior spaces from adverse external environmental effects and produce internal comfort conditions to occupants while minimizing energy consumption and its related CO2 emissions, environmental pollutions, and other negative impacts. Nano-Technology is the science, engineering, and technology conducted at the Nano-Scale that results in new functionalities and properties for improving materials and products properties and efficiency or developing new materials and products with enhanced properties and effectiveness to use in variable sectors. Nano-Architecture is the implementation of Nano-Science and Nano-Technology in the building and construction sector that promises a lot of potential and opportunities to achieve high-performance buildings in many areas such as materials, energy, and water and air purifying. Therefore, using Nano-Technology enhanced properties materials in buildings envelopes can significantly achieve high-performance for building systems while conserving natural, economic, and social environments.



Eslam Mohamed Moraekip

Nano-Technology

As an Application to Improve Buildings Envelope's Performance



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Dedication.

To

My Late Father

My Late Mother

My Brother and Sister

My Faithful Wife

My Professors, Colleagues, Friends, and Students

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Introduction.

Architectural development processes are representing significant challenges in the area of environmental conservation because they are consuming large quantities of materials, an enormous amount of energy and natural resources, producing large quantities of wastes, and resulting negative impacts on nature, economic, and social environments.

Therefore, it is necessary to take other directions of architectural development processes starting from planning, designing, constructing, operating, maintaining, and up to demolition and reusing processes to achieve high-performance building with conserve environments.

The high-performance building is the integration and optimization -on a lifecycle basis- of all high-performance attributes including energy conservation, environment, safety, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

So, one of important building's elements that should consider to achieving high-performance building is building's envelopes materials and technologies that need to increase energy efficiency and energy savings at much lower cost than is possible today.

On the other hand, one of the important methods that appear in last years to enhance materials and products properties and performance is Nano-Science and Nano-Technology. It resulted from a deeper understanding and improved expertise in the application of chemical principles that motivate condensed matter physics to improve existing products rather than creating entirely new products.

Nano derives from the Greek word Nanos (Latin nanus) meaning dwarf; Nano-Technology simply is the understanding and controlling of materials at dimensions of one to one hundred billionths for producing changes in material's properties that enhancing their usages.

Thus, Nano-Technology opens up new possibilities in materials design that can change the fundamental properties of materials like strength, conductivity, elasticity, durability, and versatility that can design to create different materials with better properties.

Therefore, Nano-Technology is bringing new building materials and products with significant properties that offer a lot of building's performance benefits, potentials, and opportunities.

Then, Nano-Architecture is the theory of achieving Nano-Technology in the field of architecture by considering Nano-Architecture elements such as Nano-Materials and Nano-Energy.

The use of Nano-Technology in architecture is wide and varies from the early stages of sketching up to the final touches of finishing especially in choosing the right material that will not only reflect the design.

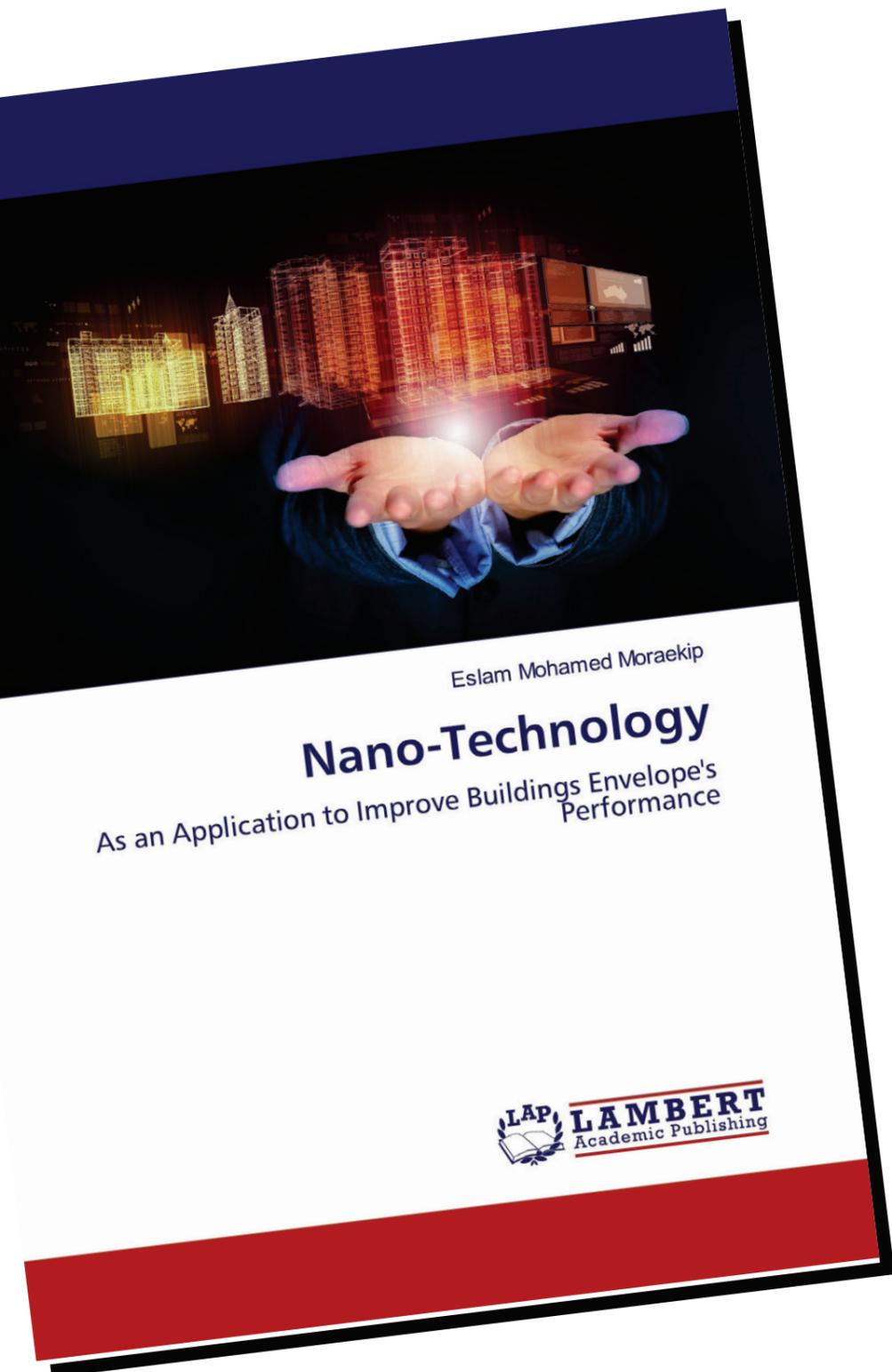
Building's envelopes are one of the important building's elements that should consider through all buildings stages to create high-performance building's envelopes with conserving indoor and outdoor environments because they control the relationship between building's interior spaces and outdoor environments.

Thus, Nano-Technology can provide significant benefits for building's envelopes elements through using their enhanced materials properties and its applications in building sector to achieve a high-performance building.

So, the aim of this research is to study the applications offered by Nano-Technology to provide Nano-Materials that can use in insulation materials and systems. Moreover, to examine the new materials from the point of view of architects, interior designers, and designers to gain Nano-Architecture benefits and potentials that can improve the performance of buildings' envelopes and conserve nature, economic, and social environments.



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