

## **The role of green nanotechnology in raising the efficiency and performance of the interior architecture of health centers**

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### **Introduction to the research:**

The importance of green nanotechnology in the field of interior architecture lies in improving the efficiency and performance of already existing buildings or by developing the properties of materials used in interior architecture, whether they are construction materials or complementary materials to achieve the concept of sustainability, hence the importance of this research in how to use applications of green nanotechnology in addressing the deficiencies in the interior architecture of local health centers and creating a safe health environment and improving the efficiency and performance of the internal architecture of these centers in accordance with the concept of sustainability can help to improve the level of service these centers provide to patients.

### **Search problem:**

**The research problem is focused on the following question:**

- Can green nanotechnology improve the efficiency and performance of the interior architecture of health centers?

### **The importance of research:**

- Keep up with technological development by knowing the impact of green nanotechnology on materials used in the interior architecture of health care centers in accordance with the concept of sustainability .
- Attention to the quality of the interior environment through the use of sustainable local materials implemented by green nanotechnology.
- The importance of achieving the economic dimension of the interior design of health care centers through green nanotechnology should be highlighted.

### **Search goal:**

- Highlighting the role of green nanotechnology in the interior architecture of health centers in order to improve the quality and efficiency of the internal environment of health centers in order to achieve the concept of sustainability .

- Build and utilize the interior architecture designer's knowledge of green nanotechnology in the field of interior architecture of healthcare centers.

### **Procedural steps to search:**

(First: Nanotechnology, its principles and features II: green architecture and its principles III: nanotechnology and its objectives and principles IV: nanotechnology and its objectives v: nanotechnology and sustainable interior architecture VI: evaluation of nanobudses VII: Health Centers VIII: a global building with Nano-applications and study the impact on sustainability).

### **Nanotechnology:**

Nanotechnology is an advanced technology based on understanding and studying Nano science and other basic sciences while providing the technological capability to manufacture micro materials and control their internal structure by restructuring and arranging atoms and their constituent molecules, ensuring access to unique products that are employed in a variety of applications.

### **Principles and features of nanotechnology:**

- It has the ability to control the rearrangement of atoms and molecules, thus discovering new properties of materials and creating many new materials with a wide range of uses that greatly affect architecture, which give us the ability to directly control structural or non-structural materials .

The physical and chemical properties of the material at the nanoscale differ from those of the same material at its natural scale.

- Nanotechnology greatly improves the efficiency of the material in every aspect of life such as energy, electricity, building materials and ease of approaching the material by making it smaller, lighter, stronger, faster, cheaper and less energy-consuming.

### **Basic principles of green buildings:**

Green buildings are environmentally friendly buildings, this is because they consume less energy and water.

The most important principles of these buildings include:

- Climate adaptation.
- Reducing the use of new resources and materials.
- Energy conservation.

### **Nanotechnology architecture objectives:**

- Reducing energy consumption requirements and reducing austerity.
- Increase human thermal comfort within the interior.
- The trend towards activating "zero energy."
- Reducing the value of building ownership by reducing the energy consumption of the building.
- The trend towards low-energy housing.
- Maintaining the integrity of the ecosystem by reducing the amount of CO2 emissions in the environment.
- Get a building that controls temperature and humidity depending on climatic conditions.

- Get a lightweight, stronger, durable, crack-resistant and crack-resistant building that monitors malfunctions and damages and repairs them themselves.
- Get a self-cleaning building.

Improving the environmental and economic performance of cement and concrete.

#### **Green nanotechnology:**

Green nanotechnology refers to the use of nanotechnology and nanotechnology products to enhance the environmental sustainability of processes that currently produce negative factors for the environment.

- Namely, the development of clean technologies to reduce the environmental and human health risks associated with the manufacture and use of nanotechnology products, and to encourage the replacement of existing products with potential new nano products that are more environmentally friendly throughout their lives .

- It also means using nanotechnology to make current manufacturing processes of non-nanomaterials and more environmentally friendly products.

#### **Green nanotechnology objectives:**

- Production of nanomaterials and products without harming the environment or human health.
- Use existing principles in green chemistry and green engineering to make nanomaterials and nanoproducts without toxic ingredients.
- Less use of renewable energy and inputs where possible at low temperatures.
- Think about the life cycle of each design for all engineering stages as well as the provision of nanomaterials and products with less impact on the environment.
- Make current manufacturing processes for non-nanomaterials and more environmentally friendly products.

#### **Nanotechnology and sustainable interior architecture:**

Nanotechnology seeks to achieve sustainable design in two directions:

**Direction 1:** Improving the performance efficiency of already existing buildings by (insulation materials, paints, nano devices).

**Direction 2:** Development of the properties of materials used in the implementation of sustainable architecture and interior architecture (construction materials, finishing materials).

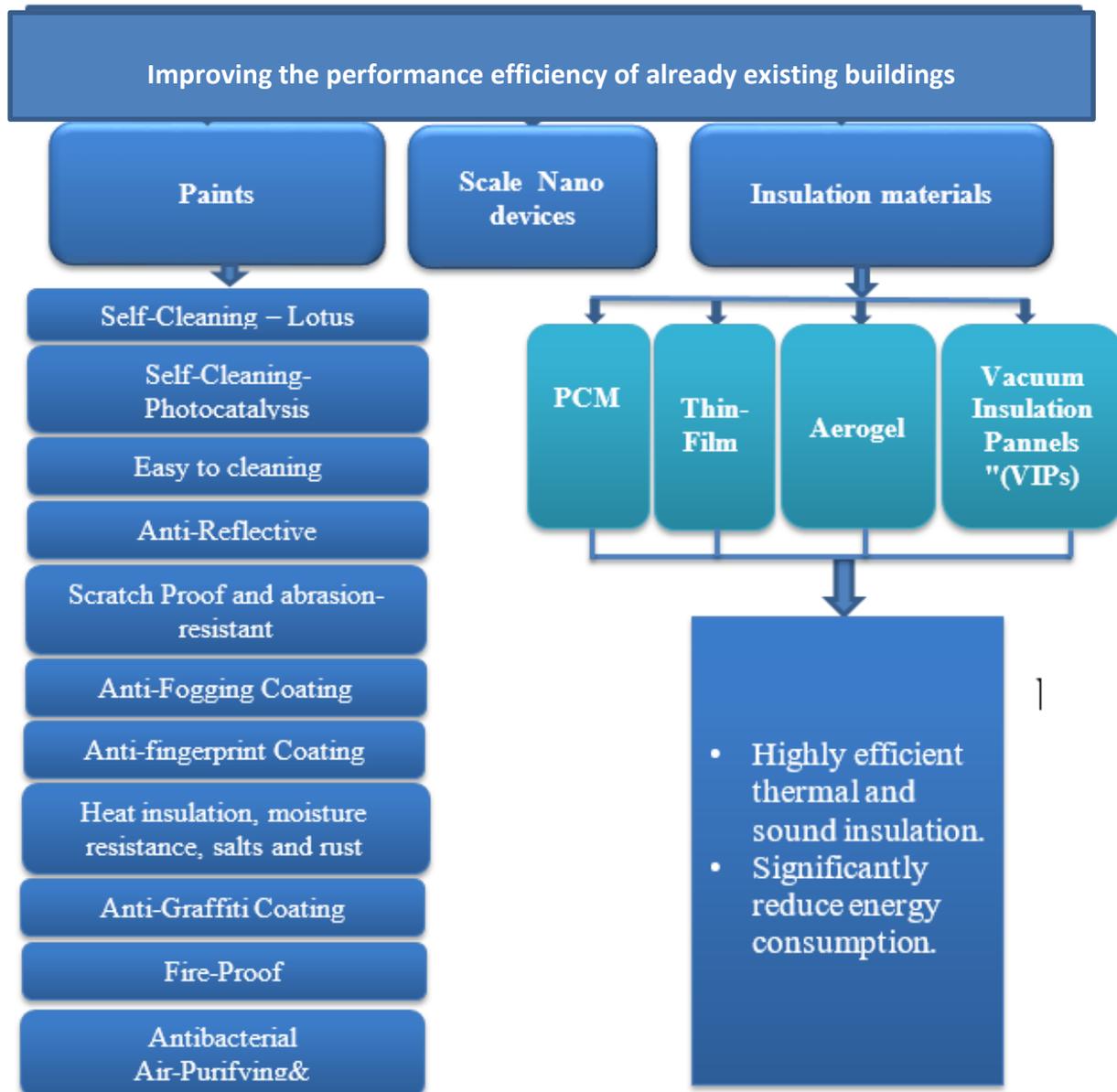


Fig (1): improving the performance efficiency of already existing buildings "Researcher's Design"

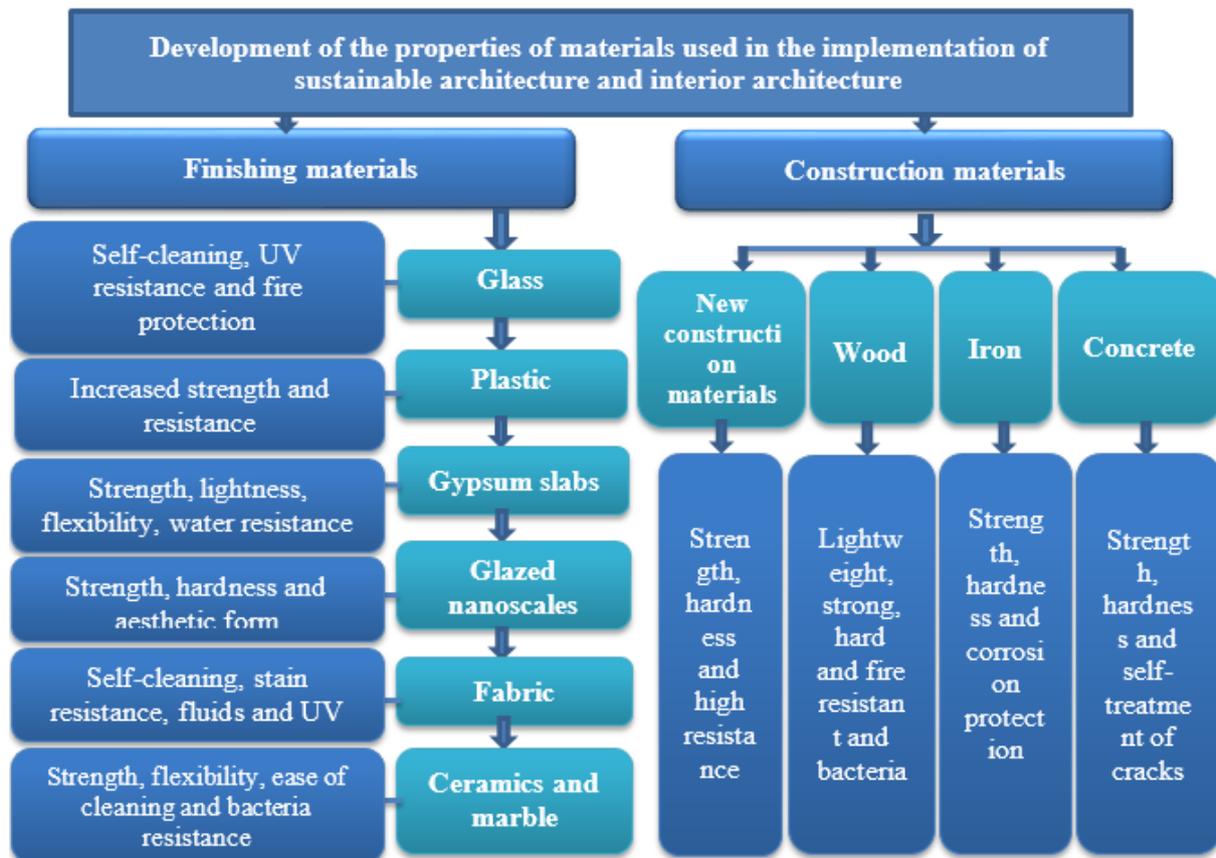


Fig (2): Development of the properties of materials used in the implementation of sustainable architecture and interior architecture"Researcher's Design"

### Evaluation of nano buildings:

Nano buildings are evaluated on several points: energy saving, maintenance, self-cleaning (lotus effect), self-cleaning (photo catalysis), aesthetic standards, functional standards, life span, fire resistance, eco- friendly, anti-reflection, anti-graffiti, air purification, antibacterial, heat insulation, moisture resistance, also salts, rust and each of these points takes a score for evaluation.

### Interior architecture of health care centers:

It is the first level of communication in the health-care system to improve public health, through which basic services such as child health services, vaccinations, maternal health, reproductive health, chronic, infectious and parasitic diseases and public health services are provided. The internal design of health care centers takes into account several conditions, including noise reduction, maintaining patient privacy, thermal, light and acoustic efficiency of patients, taking into account the environmental safety of the medical team, patients and escorts, and self-cleaning of the internal vacuum to prevent the spread of infections and viruses which some local health centers lack.

**Global building with Nano applications and studying the impact on sustainability:**

**Table (1): LIV Hospital Ulus**

LIV Hospital Ulus	
<b>Location of the building</b>	Istanbul
<b>Building activity</b>	Hospital
<b>Architectural</b>	Levent Cirpici & Atilla Kuzu
<b>Date of construction</b>	2012

**Fig (3): LIV Hospital Ulus**  
<https://www.google.com/search?q=LIV+Hospital+Ulus,+Istanbul&sxsrif=APq>

| **Description of the building** | |
| -The design idea of the hospital is inspired by the idea of self-recovery of human body diseases and the shape of cells and internal tissues of the body.  - The interior architecture of the hospital depends on the use of natural materials and nanomaterials for sustainability where:  Self-cleaning and easy-to-clean nanodyronic paints, the use of air purifier paints, resistance to bacteria and pollutants, good ventilation of the internal vacuum and deodorant, fire resistance paints, scratch resistance, friction, corrosion and fingerprint resistance were used, thermal and acoustic insulation materials were used that achieved the highest thermal and acoustic efficiency and thus rationalize energy consumption, as well as nanoscale, ceramic and acrylic nano panels, which are aesthetically strong, easy to clean, as well as nano-resistant curtains. For stains, liquids, UV rays and fire resistance. As shown in the form of 4.5. | **Fig (4): LIV Ulus Hospital from the inside**  <https://www.google.com/search?q=LIV+Hospital+Ulus>    **Fig (5): Liv ulus Hospital Patient Rooms**  <https://www.google.com/search?q=bedroom+for+liv+h> |

**Results:**

1- Nanotechnology has succeeded in achieving sustainability standards in two directions:

- Improving the efficiency and performance of the interior architecture of already existing buildings through (insulating materials, paints or nano devices).
- Develop and improve the properties of materials used in interior architecture, whether structural or complementary.

2- Nanotechnology applications have helped interior architecture designer in many innovative solutions in all types of interior spaces in general and in the interior architecture of healthcare centers in particular, which in turn has increased the efficiency and performance of the interior architecture of healthcare centers.

3. Nanotechnology plays an important role in rationalizing electricity consumption, reducing the costs of maintenance, cleaning and manpower and extending the life span of the building.

**Recommendations:**

1. Directing scientific and applied research towards nanotechnology science to researchers and academics in scientific colleges, especially in the field of interior architecture.

2. Try to keep up with technological progress and raise awareness among interior architecture designers with nanotechnology and its importance in interior architecture through conferences and seminars.

3. Replace traditional materials used in interior architecture with green nano materials, especially in health centers, because of their unique properties that work to achieve sustainability at its best.

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