

Using Self-healing materials to raise the efficiency of kindergartens (Educationally, aesthetically, healthily, economically, and environmentally)

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Abstract

The function of preparing the internal environment for kindergartens is to provide a stable, organized, and rich internal space that encourages learning, as kindergartens must achieve the needs of childhood. All its parts must be planned so that the child can learn and discover his abilities and tendencies.

At the age of 4-6 years, the child is full of energy and curiosity; He/she has a strong desire to test his environment and explore his surroundings with no regard for safety.

When choosing interior design materials and components for kindergartens, it is essential to pay attention to the physical integrity and safety of the child in this stage. Which requires the provision of materials characterized by durability and reliability to suit the activities carried out, and in a manner that does not conflict with the achievement of other economic and environmental aspects.

The research problem was that all the materials and components of the interior design deteriorate over time, which requires checks and detection of defects to treatment or maintenance, a process that may be difficult and expensive, so scientists began to search for materials that can sense the defect, work to stop it and then start the process of self-healing or repairing itself as quickly as possible, which is called self-healing materials.

This research aims to raise the efficiency of kindergartens by using self-healing materials to achieve educational, aesthetic, health, environmental, and economic aspects.

The research follows the descriptive and analytical approach, as it presents some of the reasons for the deterioration of materials in kindergartens, along with analyzing the damages resulting from the deterioration of materials, then the concept of self-healing materials, their mechanisms, some possible examples for use of self-healing materials instead of traditional materials and analyze the benefit of their use in kindergartens.

Key words:

kindergartens, Self-healing materials, Self-repairing materials.

Introduction:

The child practices many recreational and educational activities inside the kindergarten and spends a long time dealing with the materials and components of the interior design surrounding him, which requires the provision of a healthy climate inside the place and requires the provision of materials that are durable and long-lasting to suit the activities that he performs, and without conflicts with the realization of other economic and environmental aspects.

To keep up the efficiency of the kindergarten and to make children safe, there is a need for making periodic curative or preventive maintenance. But the process of manual maintenance and repair for materials and interior design elements consumes a lot of time, effort, money,

resources, and it may need to stop the activities that are performed in the place until the maintenance process is completed, this causes any institution to postpone or neglect the maintenance process of the place and its components, which negatively affects the child, physically and morally.

So, what we need is access to materials that behave similarly to the human body: sensing the defect, working to stop it, and then starting the repair process as soon as possible and above all on its own.

Currently, researchers are learning from nature how to repair itself, such as when a person accidentally cuts a finger or the plant stalk breaks. This was possible to imitate in the laboratory, where scientists began to work on the production and development of materials that can self-repair the damage arising in their internal structure, which is called self-healing materials.

Importance:

Highlight the several benefits of using self-healing materials in kindergartens.

Problem Statement:

All materials and components of the interior design deteriorate over time, which requires checking and detection of defects to start treatment or maintenance, a process that may be difficult and expensive. The maintenance process consumes a lot of time, effort, money, resources, and it may need to stop the activities that are performed in the place until it is completed. Also, delaying or neglecting the place maintenance negatively affects the child physically and morally.

Aims and Objectives:

This research aims to raise the efficiency of kindergartens by using self-healing materials to achieve educational, aesthetic, health, environmental, and economic aspects.

Hypothesis:

- The use of self-healing materials contributes to maintaining the physical and moral health and safety of children.
- The use of self-healing materials extends the life span of the place and increases the efficiency of the place (functionally, environmentally, economically, aesthetically).

Methodologies:

The research follows the descriptive and analytical approach, as it presents some of the reasons for the deterioration of materials in kindergartens, along with analyzing the damages resulting from the deterioration of materials, then the concept of self-healing materials, their mechanisms, some possible examples for use self-healing materials instead of traditional materials and analyze the benefit of their use in kindergartens.

Content:

After discussing the definition of Self-healing materials, the research contains four main parts, as follows:

First: kindergartens:

- (1) Definition of Kindergarten:
- (2) Children's activities in kindergarten:
- (3) The reasons for the deterioration of the material:
- (٤) Disadvantages for the deterioration of the material:
 - A. Impact of materials deterioration for children.
 - B. Impact of materials deterioration for the educational institution/owner of the place.
 - C. Impact of materials deterioration on the environment.

Second: Self-healing materials:

- (1) Self-healing materials mimic nature
 - Self-healing materials mimic bone
 - Self-healing materials mimic skin and blood clots
 - Self-healing materials mimic plants

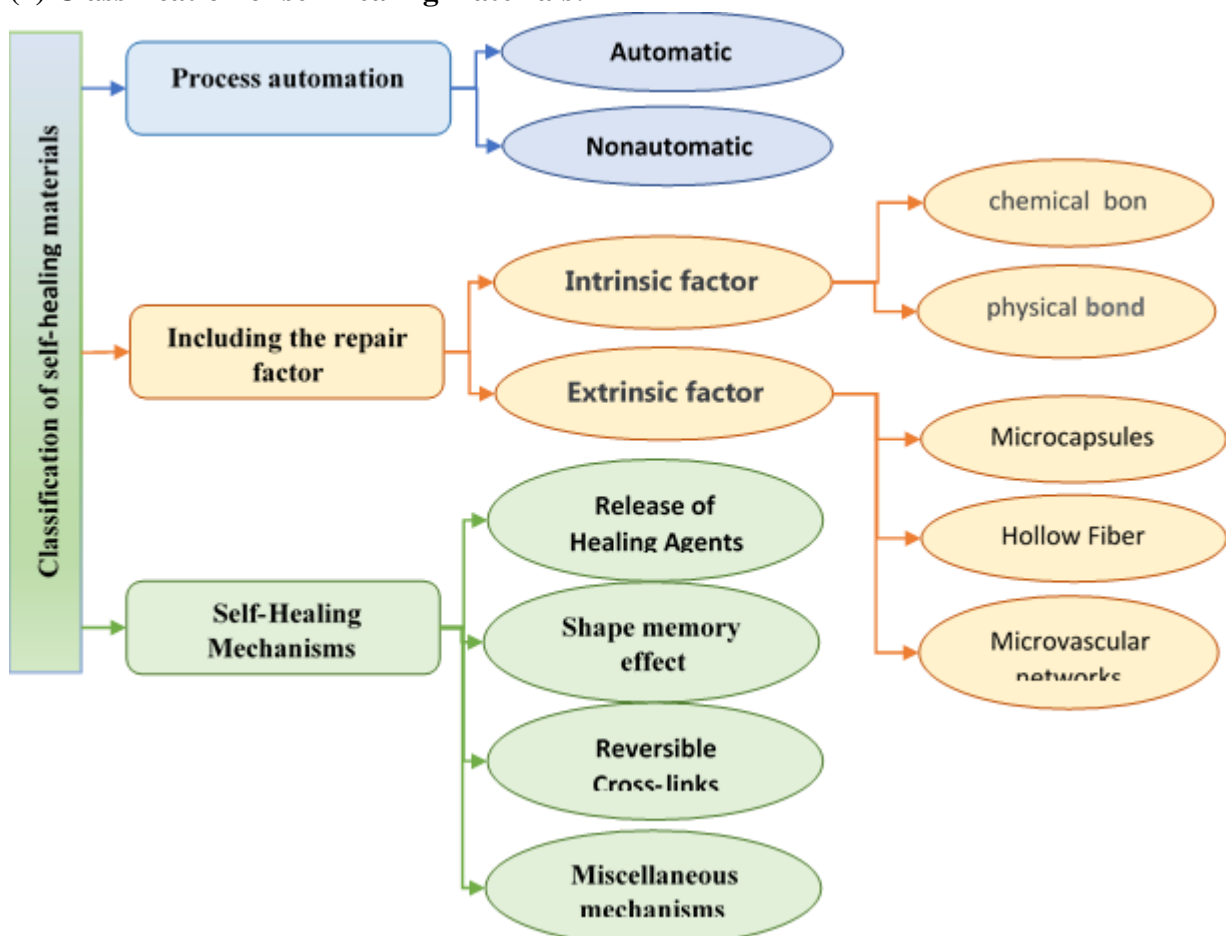
(2) Classification of self-healing materials:

Diagram (4) showing the Classification of self-healing materials

First: in terms of process automation:

Automatic, Nonautomatic.

Second: In terms of including the repair factor:

Intrinsic factor, Extrinsic factor.

Third: In terms of the Self-Healing Mechanisms.**(3) Self-Healing Mechanisms:**

- A. Release of Healing Agents.
- B. Shape memory effect.
- C. Reversible Cross-links.
- D. Miscellaneous mechanisms.

Third: The use of self-healing materials in kindergartens:

This part shows some possible examples for use of self-healing materials instead of traditional materials in kindergartens.

Fourth: The benefit of using self-healing materials in kindergartens:

This part shows the functional, aesthetic, health, economic, and environmental benefits of using self-healing materials in kindergartens.

Results:

- 1-The use of self-healing materials in kindergartens contributes to raising the efficiency of the place functionally, aesthetically, economically, and environmentally.
- 2-Employing self-healing materials in kindergartens contribute to preserving the physical and moral health and safety of children.
- 3-The use of self-healing materials will help eliminate the need for traditional maintenance processes, save time and effort, increase the durability and longevity of the product, and provide the energy needed to re-repair by relying on internal clean energy of these materials.

Recommendations:

- The research authorities should study and provide self-healing materials to make them accessible for use by specialists.
- Faculties of applied arts and research centers should urge the designer to make use of self-healing materials and their characteristics.
- Research centers and competent authorities shall encourage, support and finance research related to self- healing materials and their development.
- Faculties of applied arts and research centers should Support collaborative research between specialization and modern sciences and their applications.

Conclusions:

Delaying or neglecting the kindergartens' maintenance negatively affects the child physically and morally. Also, the maintenance process consumes a lot of time, effort, money, resources. Hence the idea of the research is to employ Self-healing materials in kindergartens,

which are materials that can self-heal, as happens when a person accidentally cuts a finger, or the plant stalk breaks.

The research presents some of the reasons for materials deterioration in kindergartens, then analyzing the impact of materials deterioration on children, the educational institution, and the environment. Then it shows the concept of self-healing materials, their mechanisms, some possible examples for use of self-healing materials instead of traditional materials and analysis of the benefit of their use in kindergartens.

Functional and economic benefits through the materials and products performing their function to the fullest without the need for traditional maintenance. The aesthetic benefit through the preservation of the components of the interior space, which achieves aesthetic delight and enhances the positive aspects of children. The environmental benefit by reducing the disposal or replacement of materials and reducing the depletion of materials that are used, whether in maintenance operations or in obtaining alternatives, in addition to maintaining the health and safety of children physically and morally and not being exposed to harm during various educational activities inside the place.

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