

Employing smart materials in beautifying the urban environment from a sustainability perspective

DR. Mohamed Hamdy Hussein

lecture -Faculty of Applied Arts, Badr University, Egypt, mohamedelhamahmy@gmail.com

Paper History:

Paper received 19th June 2021, Accepted 10th August 2021, Published 1st of September 2021

Abstract:

Employing smart materials in beautifying the urban environment from a sustainability perspective
Smart materials are that materials who have one or more properties that can be significantly altered in a control manner by external impetus, such as stress, temperature, moisture, pH, electric and magnetic field. Smartness can be describe by self-adaptability, self-sensing and self-repairing. These smart materials offers numerous of application in every field. Smart materials contribute to raising energy efficiency, while using high levels of environmental performance and controlling design surfaces. Smart materials contribute to achieving the use of renewable energy; passive solar self-heating, natural lighting, and natural cooling.

With the development of material science, many new, high-quality and cost-efficient materials have come into use in various field of engineering. In the last five to ten decades, the materials became multifunctional and required the optimization of different characterization and properties. With the last evolution, the concept has been driving towards composite materials and recently, the next evolutionary step is being contemplated with the concept of smart materials. smart materials are new generation materials surpassing the conventional structural and functional materials. These materials possess adaptive capabilities to external stimuli, such as loads or environment, with inherent intelligence. The possibility of applying advanced technologies such as controlling kinematic and intelligent systems in designing urban elements to achieve greater environmental compatibility. The research problem stems from the need to monitor smart materials that can be used in beautifying the urban environment that can achieve sustainability considerations. The research aims to monitor and conclude considerations of employing smart materials in beautifying the urban environment from the perspective of sustainability.

Materials have become a fundamental pillar upon which all the different design specialties are based, including urban design with its various elements. The technologies associated with the development of materials have emerged as a result of the great development of information technology and nanotechnology and their incorporation into various areas of materials development, where materials can respond to environmental variables and usage variables in a fast and easy manner to meet human needs. Thus, smart materials are considered one of the most important materials in response to sustainability factors and the ability to implement sustainability considerations.

Design based on smart materials is a modern design approach to building and sustainable comprehensive development that seeks to reduce the social and environmental burden, which is applied to the entire life cycle of the urban environment, while achieving economic feasibility and encouraging sustainability at the local and global levels, especially with regard to environmental, societal and economic performance.

Problem statment

The research problem can be identified as follows: The global trend towards creating dynamic models that are compatible with the environmental and climatic characteristics of the urban environment, with efficiency in the use of materials, the possibility of disassembly and installation and functional design flexibility, created the need to monitor smart materials that can be used in beautifying the urban environment that can achieve sustainability considerations, while determining considerations throughout the design and operation stages .

Aims and objectives

The research aims to monitor and conclude considerations of employing smart materials in beautifying the urban environment from the perspective of sustainability .

Methodology

The study follows a descriptive approach in presenting and analyzing the sustainable smart materials used in beautifying the urban environment.

Conclusions :

- The life cycle of sustainable smart materials can be achieved through : reducing the consumption of non-renewable resources, reducing the environmental loads of waste and pollution, improving economic resource management, and the environmental and social performance that is greatly affected by the

performance of smart materials. - Sustainability considerations can be achieved in smart materials by employing smart materials that are compatible with the environmental characteristics of the urban environment through the following- : Efficiency in the use of smart materials to achieve the finishing of the urban environment in the best possible functional and environmental performance. - Using smart materials from recyclable materials or reusable components. - The use of smart materials with systems capable of dismantling, installing and extending in the future. - Use of smart materials with ready-made systems and standard sections. - The possibility of applying smart materials in controlling kinematic and intelligent systems when designing the urban environment to achieve greater environmental compatibility.

Keywords :

Smart Materials - Sustainability - Urban Environment Beautifying

References :

1. (Meyer, G., Kary Främling and J. Holmström. "Intelligent Products: A survey." *Comput. Ind.* 60 (2009): 137-148.
 2. Ensan Senem Özgönül (2010) *Smart Materials and Sustainability: Application of Smart Materials in Sustainable Architecture* – LAP Lambert Academic Publishing.
 3. Morteza Mahmoudian & Parisa Sharifikheirabadi (2020) uses of new/smart materials in the green building with sustainability concerns, *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*. Volume 11 No.3.
 4. Alexander Ginzburg (2016) *Sustainable Building Life Cycle Design*, MATEC Web of Conferences 7 , 02018
 5. Elattar, S. M. S. (2013) *Smart structures and material technologies in architecture applications*. *Scientific Research and Essays*. 8 (31) : 1512-1521.
 6. Mahmoud Wahid Saidam, Karam M. Al-Obaidi, Hazreena Hussein and Muhammad Azzam Ismail (2017) *The application of smart materials in building facades*, *Eco. Env. & Cons.* 23 (Nov. Suppl. Issue) : 2017
 7. Patricia Romero-Lankao, Daniel M. Gnatz, Olga Wilhelmi and Mary Hayden. (2016) *Urban Sustainability and Resilience: From Theory to Practice*, *Journal of Sustainability* (8)1224 .
-