

The impact of nanotechnology in improving the quality of interior design

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Abstract:

Nanotechnology, which has emerged as one of the most important innovations of the 21st century, has revolutionized science and technology, making it a vital element in several sectors, particularly interior design. It has been used to improve the quality and value of interior spaces, adding a creative dimension to architecture that combines innovation and aesthetic standards. Nanotechnology also offers new horizons for sustainable design through multiple applications, including advanced coatings, effective thermal insulation, air purification technologies, and solar cells. Hence, the importance of studying this technology to ensure its potential is optimally exploited. The concept of "nanotechnology architecture" has emerged as an architectural approach aimed at promoting environmental sustainability. It relies on the use of innovative materials and tools to improve energy efficiency and reduce reliance on non-renewable resources, with a focus on clean energy. Nanotechnology has significantly contributed to increasing the efficiency of traditional building materials such as glass and concrete, enabling the design of buildings that interact dynamically with the surrounding natural environment. This technology has paved the way for an effective integration between smart architecture and urban sustainability, through the development of smart and environmentally sustainable materials. When applied locally, it enables the construction of highly efficient buildings that combine technological innovation with structural sustainability. The concept of nanotechnology and nanoscience was discussed in this context, highlighting their role in improving the environmental and economic efficiency of buildings. The analysis focused on the compatibility of nanomaterials with design principles in terms of functional and aesthetic properties, highlighting their remarkable features such as self-cleaning, antibacterial, self-healing, advanced thermal insulation, and other smart properties. These applications include numerous materials such as cladding, paints, and textiles, enhancing the sustainability of buildings using innovative technologies such as nanoscale solar panels to reduce carbon emissions. Practical examples of buildings using nanotechnology were analyzed, focusing on thermal insulation and the use of self-cleaning and antimicrobial materials, given their clear economic benefits. The importance of nano-based insulation materials in controlling indoor temperatures and significantly reducing energy consumption was also highlighted. Finally, the relationship between the use of these materials and the design of sustainable buildings compliant with the LEED global rating system was reviewed. This system highlights the positive impact of nanotechnology on developing sustainable building assessment strategies and enhancing their environmental and social performance. The research problem lies in the scarcity of studies addressing the applications of green nanotechnology in sustainable interior design, which is one of the challenges facing this field. Furthermore, it has been noted that some interior design professionals overlook the importance and benefits of replacing traditional technologies currently used with ones based on green nanotechnology to achieve sustainable interior design goals. The research aims to explain the concept of "sustainable green nanotechnology" and its impact on the development of innovative materials and technologies that promote environmental sustainability and reduce the negative impact on nature, with a focus on its use in various sectors. It also aims to conduct a comprehensive analysis of the role of green nanotechnology applications in sustainable interior design, while evaluating the effectiveness of this technology in achieving sustainability goals, such as improving energy efficiency and reducing the use of natural resources. It also aims to clarify the compatibility of nanomaterials with the LEED system. Research results: Clarifying the importance of using sustainable green nanotechnology in architecture and interior design by improving the performance efficiency of existing buildings or developing and enhancing the

properties of materials used in interior design. Clarifying the compatibility of nanomaterials with the Leadership in Energy (LEED) system. Accordingly, the research includes two axes: the first is the theoretical aspect, which addresses the study of sustainable green nanotechnology and the importance of its application to sustainable building architecture and interior design materials, as well as its applications in the field of energy, whether for energy generation, rationalization of consumption, or storage. The second is the analytical aspect, which highlights global models that have achieved sustainability standards through the use of nanotechnology applications to improve energy management efficiency through innovative solutions for rationalization, storage, and production of energy, as well as studying the compatibility of nanomaterials with the Leadership in Energy (LEED) system.

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