

# Chapter 7

## Role of Nano Technology in Improving the Energy Efficiency of a Material for Sustainable Buildings

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### **ABSTRACT**

*The need for sustainable building practices has never been greater in the world that is changing so quickly these days. Aiming to minimise their impact on the environment and boost energy efficiency, engineers and architects are always searching for new and creative materials that can satisfy these needs. Although nanotechnology has long been used in other scientific and technological domains, it is still relatively new in the architectural field. The challenge of nano architecture is to create new materials, add new properties, or improve existing materials that are used in building architecture or during the construction phase. When traditional wood is combined with nanotechnology, a nano-wood composite is created that has improved characteristics like mechanical strength, fire resistance, durability, and water immersion.*

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## **INTRODUCTION**

The natural realm, with all of its components, is a gift from God the Creator to humanity. It is their responsibility to obtain nutrition from it and to conduct their daily activities within the constructions of cities that they inhabit without inflicting damage or corruption. However, with changed ecosystems as a depletion of resources from nature, and environmental degradation, the present global trend necessitates a push to restore ecological equilibrium. As a result, the idea of sustainability as well as sustainable growth have arisen, with the goal of meeting the requirements of the current generation while preserving future generations' ability to fulfil their own needs. This needs social engagement, which is now completely distinct from the pressing environmental challenges that have captured the worldwide spotlight in recent decades.

The world has been dealing with a large number of environmental concerns during the last few decades. However, climate change may be the most significant environmental challenge to address. Over the past 40-50 years, surface temperatures have increased by 1.5-2 °C. The earth's temperature will rise dramatically over the next 50-100 years, creating severe living circumstances with disastrous effects. The increase in temperature is the leading source of changing the climate (Péan et al., 2023), (Fischer et al., 2015). It needs to be answered swiftly and taken seriously. Global warming has caused an average temperature of the earth's surface to rise substantially during the last few decades. Carbon-associated gas emissions (greenhouse gases) from the combustion of fossil fuels in various sectors, transportation, electricity generation, agriculture, and commercial sources are the primary cause of global warming. Pollution, urbanisation, population growth, and other factors all are contributing to changing the climate by disrupting the ecosystem's balance. Given the rapid development of the world population, a number of serious difficulties have arisen, including pollution, economic obstacles, and environmental concerns. To address these environmental concerns, many building professionals are actively looking for innovative adaptable techniques. Among these, nanotechnology steps out as a critical field aimed at improving the effectiveness of the built setting and playing an important role in meeting future difficulties. Nanotechnology, due to the unique features of nanoparticles, has several uses in the environment, agricultural, food, and energy sectors. Not only does environmental nanotechnology address a wide range of environmental issues, but nanotechnological goods and processes are regarded among the most effective and inventive tools/modes for achieving sustainability goals.

The purpose of this study is to investigate the efficacy of using nanotechnology techniques into building in order to harness the obtained characteristics of materials along with their effects on the internal thermal environment. The combination of

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