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Nanotechnology Applications to Improve the Functional Performance of Sustainable Garments

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Abstract:
Nanotechnology has become one of the most important areas of research. Nanotechnology holds a very promising future for clothing. The development of functional finishings based on nanotechnology has endless possibilities. Nanotechnology is used in clothing to enhance fabric properties, comfort, function and sustainability. Nanomaterials are nowadays increasingly used in various applications ranging from sports and healthcare to aerospace and fashion. Nanomaterials, such as nanoparticles, nanofibers and nanocomposites embedded in clothing, provide significant improvements in the quality of clothing products. The unique properties of nanotechnology have led to its rapid expansion in the clothing industry. It contributed to the production of high-performance and sustainable clothing. Nanotechnology has been used to impart many desirable properties to clothing such as antibacterial, water resistance, self-cleaning, wrinkle resistance, and other applications. This study aims to find ways to benefit from nanotechnology to improve the functional performance of clothing and make it more sustainable. The study concluded that nanotechnology in the field of clothing and its various applications demonstrate the enormous potential of nanomaterials in enhancing the functional properties of fabrics and clothing. The use of natural materials in preparing nano clothes enhances environmental friendliness, which is an important dimension of sustainability. The noticeable improvement in properties makes nano-preparations for clothing more economically viable, which is another dimension of sustainability. By exploring the enormous potential of nanotechnology to enhance clothing properties and sustainability, it can serve as a valuable resource for researchers and inspire further research, innovation and future development of advanced textile products. Nanotechnology has revolutionized many industries, the textile and clothing industry in particular. The integration of nanotechnology into clothing has opened a large number of opportunities to improve the properties and sustainability of fabrics. Nowadays, functionality and comfort in clothing fabric are the most important features that wearers look for. A variety of clothing technologies are developed to meet customer needs. This research problem asks the following questions: 1. What is the possibility of producing sustainable clothing using nanotechnology? 2. How can nanotechnology be used to improve the functionality of fabrics and make them more sustainable?
The research objectives are studying the characteristics and applications of nanotechnology in the field of clothing, and Learning about the importance of nanotechnology in the field of sustainable clothing. The research relies on the descriptive analytical method.
Results: The research results can be summarized in the following points: Nanotechnology in clothing and its diverse applications demonstrate the enormous potential of nanomaterials in enhancing the functional properties of fabrics and clothing. The use of natural materials in preparing nanotextiles enhances environmental friendliness, which is an important dimension of sustainability. The significant improvement in properties makes nano-preparations for clothing more economically viable, which is another dimension of sustainability. By exploring the enormous potential of nanotechnology to enhance textile properties and sustainability, it can serve as a valuable resource for researchers and inspire further research, innovation and future development of advanced textile products. Nanotechnology antimicrobial treatments offer advantages such as improved durability and reduced environmental impact compared to conventional antimicrobial treatments. This makes it suitable for a wide range of applications, including healthcare textiles, sportswear and personal protective equipment, where maintaining cleanliness and preventing bacterial contamination is extremely important. Nano technology-based UV protection offers benefits such as reduced risk of sunburn

and skin cancer along with long-lasting performance, creating sustainability. Nanotechnology contributes to improving the flame resistance of clothing. Therefore, flame-resistant nanomaterials are used to increase safety in various textile products such as protective clothing. Nanoparticles such as titanium dioxide (TiO2) are used in clothing preparation to achieve self-cleaning capabilities. Therefore, these nanomaterials are used in outerwear, especially white clothes that get dirty quickly, and household clothes, where resistance to liquids and stains is required. Nanotechnology offers innovative solutions for controlling odor and moisture in clothing. Nanoparticles, such as silver or zinc oxide, can be incorporated into textiles to inhibit the growth of odor-causing bacteria, keeping the fabric fresh and odor-free even after prolonged use.

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Nanotechnology, Sustainability, Functional Performance, Sustainable clothing

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