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Chitosan-based Structural Color Films for Humidity Sensing with Antiviral Effect

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Introduction

Chitosan-based structural colour films have emerged as promising materials for various applications due to their unique optical properties, biocompatibility, and antibacterial properties. In this article, we delve into the recent advancements in utilizing chitosan-based structural colour films for humidity sensing with an additional focus on their antiviral effects. We discuss the fabrication methods, mechanisms of humidity sensing, and the integration of antiviral functionalities. Furthermore, we explore the potential applications and future prospects of these multifunctional materials in various fields, including healthcare, food packaging, and environmental monitoring. Chitosan, a naturally derived polysaccharide obtained from the deacetylation of chitin, has garnered significant attention in various fields owing to its biocompatibility, biodegradability, and antimicrobial properties. In recent years, chitosan-based structural color films have emerged as a novel class of materials with applications ranging from optical devices to sensors. The unique structural properties of these films, combined with the inherent properties of chitosan, make them attractive for humidity sensing applications. Additionally, the antimicrobial properties of chitosan offer an added advantage, especially in environments where viral contamination is a concern. This article provides an overview of the recent developments in chitosan-based structural color films for humidity sensing with an emphasis on their antiviral effects [1].

The fabrication of chitosan-based structural color films typically involves techniques such as self-assembly, solvent casting, and layer-by-layer deposition. One of the commonly employed methods is the self-assembly of chitosan nanoparticles into ordered structures, which can be further modified to achieve desired optical properties. Another approach involves the incorporation of photonic crystals or nanostructures into chitosan matrices to create structural color films with tunable optical properties. These fabrication techniques offer versatility in controlling the film's morphology and optical characteristics, thereby enabling tailored designs for specific applications [2].

Chitosan-based structural color films exhibit sensitivity to changes in humidity due to their porous structure and ability to adsorb water molecules. The optical properties of these films, such as color and reflectance, are influenced by the swelling or shrinking of the chitosan matrix in response to humidity variations. This phenomenon can be exploited for humidity sensing by monitoring changes in the film's optical signals. Various sensing mechanisms, including Bragg reflection, interference and diffraction, have been utilized to achieve high sensitivity and fast response times in chitosan-based humidity sensors. Chitosan possesses inherent antiviral properties attributed to its cationic nature and ability to interact with viral particles. It has been demonstrated to inhibit the replication of a wide range of viruses, including influenza, herpes simplex, and coronaviruses [3].

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Description

The antiviral mechanism of chitosan involves interactions with viral envelopes, disruption of viral entry and release processes and stimulation of host immune responses. These properties make chitosan an attractive candidate for developing antiviral coatings and materials with applications in healthcare, personal protective equipment, and surface disinfection. Recent studies have explored the integration of antiviral functionalities into chitosan-based structural color films to impart dual functionality for humidity sensing and viral inhibition. Strategies include incorporating antiviral agents such as silver nanoparticles, essential oils, or antiviral peptides into the chitosan matrix or coating the film surface with antiviral coatings. These hybrid materials exhibit synergistic effects, where the humidity sensing capabilities remain unaffected while providing additional protection against viral contamination. Furthermore, the optical response of the films can be modulated to indicate the presence of viruses, enabling real-time monitoring and detection [4].

Chitosan-based structural color films with humidity sensing and antiviral properties hold great potential for various applications, including healthcare, food packaging and environmental monitoring. In healthcare settings, these materials can be used for wearable sensors, smart bandages and sterile packaging to monitor patient conditions and prevent infections. In food packaging, they can provide real-time quality control by detecting moisture levels and preventing microbial contamination. Moreover, in environmental monitoring, these materials can be employed for indoor air quality monitoring and early detection of viral outbreaks [5].

Conclusion

In conclusion, chitosan-based structural color films offer a versatile platform for humidity sensing with integrated antiviral functionalities. The synergistic combination of optical sensing and viral inhibition properties opens up new opportunities for developing advanced materials with applications in healthcare, food safety, and environmental monitoring. Continued research and development in this field are expected to lead to further advancements and commercialization of these multifunctional materials.

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Conflict of Interest

None.

References

1. Kennedy, Emily, Daphne Fecheyr-Lippens, Bor-Kai Hsiung and Peter H. Niewiarowski, et al. "Biomimicry: A path to sustainable innovation." *Design Issues* 31 (2015): 66-73.

2. Ilieva, Lazaara, Isabella Ursano, Lamiita Traista and Birgitte Hoffmann, et al. "Biomimicry as a sustainable design methodology—introducing the 'biomimicry for sustainability'framework." *Biomimetics* 7 (2022): 37.

3. Nkandu, Mwila Isabel and Halil Zafer Alibaba. "Biomimicry as an alternative approach to sustainability." *Architect Res* 8 (2018): 1-11.

4. Hayes, Samantha, Cheryl Desha and Dayna Baumeister. "Learning from nature–biomimicry innovation to support infrastructure sustainability and resilience." *Technol Forecasting Social Change* 161 (2020): 120287.

5. Gamage, Arosha and Richard Hyde. "A model based on biomimicry to enhance ecologically sustainable design." *Architect Sci Rev* 55 (2012): 224-235.

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