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Bio-based hybrid-materials as functional coatings for high-performance textiles

F. Advanced and sustainable coatings for high performance textiles

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Abstract

Novel and smart surface coatings are constantly being developed to enhance or impart surface functional properties and protective features in order to address modern society demand for more performant products, and in particular, textiles.

In recent years, textiles industry has seen a paradigm change towards sustainable and eco-friendly techniques, owing to increased awareness of environmental problems. In this framework, bio-based hybrid materials have emerged as attractive possibilities for functional coatings on high-performance textiles, merging the benefits of renewable resources with modern material synthetic techniques.

The combination of bio-based polymers (i.e., chitosan, cellulose, alginate) with synthetic (blended) polymers or nanomaterials has resulted in the development of multifunctional hybrid materials with superior qualities. These materials provide higher mechanical strength, durability, and biocompatibility, while minimising reliance on non-renewable resources. Furthermore, the addition of bioactive substances, such as antibacterial agents, hydrophobic compounds, antioxidants, and UV-absorbing and conductive molecules to these coatings gives multifunctionality to textiles.

Bio-based hybrid and multifunctional coatings may find application in several textiles industries, such as sportswear, outdoor textiles, and medical textiles, addressing the challenge of high-performance textiles that adhere to sustainable principles, and paving the way for the textile industry to contribute to a more ecologically conscious future.

In this communication, the development of innovative hybrid nanostructured materials by different chemical synthesis strategies is reported, including the use of a suitable polymeric matrix together with functional

doping molecules or blended polymers, as well as multicomponent functional precursors and nanofillers. Additional efforts are being made to carry out green and eco-friendly synthetic protocols, starting from bio-based, natural, or waste substances, in order to produce more sustainable (multi)functional hybrid or nanostructured coatings for textiles in accordance with circular economy principles. Finally, chemical-physical and morphological characterizations of all the precursors, hybrid materials and functional coatings are also reported.

References

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