Biobased antimicrobial textiles using silica-alginate composites

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Microorganism contamination is responsible for numerous complications, potentially fatal (1.2 million of deaths annually in the world due to bacterial infections). Among these complications, infected wounds represent a widespread and common health problem. Delayed wound healing can lead to increased risk of infection and worsening of scars, resulting in increased morbidity and cost of ongoing medical care[1].

In the food industry, microorganisms can be also a problem. They are the main cause of food spoilage, resulting in significant economic loss in the food storage process. Every year, Europeans throw away 89 million tons of food, more than three times what would be needed to feed the 870 million hungry people in the world. Unfortunately, the current alternatives to control microorganisms are still insufficient. Moreover, the use of eco-friendly materials for that field is still limited.

Thus, a new approach that addresses these needs is essential to prevent damage caused by microorganism contamination while respecting the environment. The present work aims to develop antimicrobial textiles and coatings for medical (wound treatment) and agro-food (food preservation) applications. These textiles and coatings are based on silica-alginate composites loaded with ε-poly-L-lysin, a naturally occurring antimicrobial agent well-known in the medical and agri-food fields. Silica and alginate have been selected for their approval in the medical and food industry, their biodegradability and their effective control on the release of molecules[2,3]. So, in the first step, silica precursors with different functional groups have been employed in order to tailor the best interactions with the active agent and guarantee its continuous and sustainable release. In a second step, these formulations are implemented in the form of textile by electrospinning or coating by electrospraying. These techniques, based on the same principle, allow a custom shaping of the composite without altering the active agent. Afterword, physico-chemical characterization, drug release profile analysis and antimicrobial tests have been performed to evaluate the performance of each formulation.

References

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