Bioeconomy-Based Approach for Multifunctional Textile Finishing Using Bioactive Compounds

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Abstract

The bioeconomy is a strategic driver for the decarbonisation and circularity of the textile industry, promoting the replacement of fossil resources with renewable raw materials and the valorisation of residual biomass. Within this framework, the functionalisation of textile substrates with naturally derived bioactive compounds represents an advanced approach to the development of multifunctional materials with a smaller lower environmental footprint.

The Be@t project is part a driver of this transition, focusing on sustainable innovation throughout the textile value chain. Under Pillar II, Initiative 5, Measure 2, circularity strategies were developed for the a sustainable chemical extraction, stabilisation and incorporation of bioactive compounds into polymeric biobased formulationsmatrices, with a view andto their application in functional textile systemssubstrates. In this context, ultrasonic-assisted extraction and microwave-assisted extraction methodologies were explored, which ensure cell lysis and enhance process mass transfer, reducing extraction times and lowering solvent consumption. These techniques enabled the production of extracts enriched in phenolic compounds and other bioactive molecules, with high functional activity. The extracts obtained were subsequently incorporated into water-based polymeric formulations compatible with industrial textile processes. These formulations were optimised to promote homogeneous deposition on the substrate and the fixation of the active compounds, whilst simultaneously imparting colour.

Results from the extraction, application and functional activity assessment will be showcased, reinforcing the viability of these advanced extraction process to improve higher performance active coatings.

Keywords: Bioeconomy, biomass waste valorization into textile additives, waste derived functionalities, functional particles

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