4th INTERNATIONAL SYMPOSIUM ON BACTERIAL NANOCELLULOSE
3-4th October, 2019
Almeida Garrett Library Auditorium, Porto-Portugal

Bacterial Nanocellulose composites for the textile and leather industries

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Abstract

The tannery industry faces several challenges associated with high environmental impact, scarcity of raw materials and increasing consumer demand for environmentally friendly products. The worldwide production of leather is approximately 20 billion square feet per year (1). To produce one ton of leather 6.7 tons of raw skin are processed (2) an 57,000 liters of water (3) and 3.35 tons of chemicals (4) are needed. Worldwide, for bovine skin, 370 billion litres of water are consumed annually, generating 6.5 million tons of solid waste. The development of leather analogues has thus long been pursued, leading to the appearance of various materials, some synthetic, other natural. Despite the increasing interest and market pull, the market penetration of these alternative products has been relatively modest, due to high production costs, low breathability, high stiffness, accelerated discoloration, among other limitations. Also, recent market trends towards the identification of natural non-cotton derived textiles are emerging. This research intends to contribute to the reduction of the animal hide dependency by the development of composites from bacterial nanocellulose (BNC) as structural material and activated vegetable oils and other hydrophobic polymers, as a flexibilizing, mechanical reinforcing and hydrophobizing agents. The newly developed strategy here presented, based on BNC, aims at meeting the market pull from both the shoe and textiles industries regarding the need for new high-performance natural materials. A novel approach was tested for the bulk and surface modification of BC, combining simplicity, potential for application at large scale and low cost, based on the use of an exhaustion process. Through this process, hydrophobic polymers could be incorporated into the nanofibrillar matrix of BNC, aiming at obtaining a malleable, breathable and water impermeable nanocomposites. This presentation will summarize the main results on the preparation of BC-based composites featuring promising properties for application in the textile and shoe industries (5).

Acknowledgments

This study was supported by FEDER funding on the Programa Operacional Regional do Norte (NORTE2020) within the scope of the project NORTE-01-0247-FEDER-003435 (‘BUILD–Bacterial cellulose Leather’) and Bio-TecNorte operation NORTE-01-0145-FEDER-000004, FEDER funding on the Programa Operacional Factores de Competitividade–COMPETE within the scope of the project POCI-01-0145-FEDER-007136 and POCI-01- 0145-FEDER-006684, national funds through FCT–Foundation for Science and Technology within the scope of the project UID/CTM/00264/2019 and UID/BIO/ 04469/2013.

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