Lignin: an all-in-one bio-based solution?

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Nowadays, the development of sustainable textile solutions produced from renewable resources is one of the most important topics of the industry. Besides the challenges of introducing a cost-effective product able to overcome the petro-based fibres' market share, companies are seeking for multifunctional bio-based textiles. This reinforces the biorefinery concept by combining different materials from renewable feedstocks to promote remarkable characteristics. To this end, cellulose-lignin blends have received a special attention from academics and industries as carbon fibres precursors[1,2,3], and other applications that explore lignin's properties of UV protection, flame-retardancy, antibacterial, and hydrophobicity[4,5,6].

Aligned with the growing demand for sustainable materials, CeNTI (multi-sectoral R&D institution in the fields of smart and functional materials), CITEVE (technological Institute providing R&D, technical support and services to companies acting in the textile & clothing business), CAIMA, from Altri Group (a leading Portuguese eucalyptus pulp producer with high efficiency) and the University of Aveiro (experienced research group in the field of wood chemistry), have been working to support Portuguese textile and clothing value chain, strengthening the knowledge on the production of man-made cellulose fibres (MMCFs) from certified and sustainable managed sources, through the Bioeconomy at Textile project (be@t).

This study used the method of direct additivation of the spinning dope to produce Lyocell fibres with 5 %, 10 %, and 20 % of kraft lignin on cellulose basis. The produced fibres were tested in terms of mechanical properties, yielding a reduction of tenacity, still within Lyocell and Viscose range (2-3 cN/dtex). Intending to prove the claims attributed to lignin as an **all-in-one solution** to produce multifunctional textiles, characterization analysis was performed, such as thermogravimetric analysis (TGA), contact angle, and near-infrared (NIR) spectroscopy. The results suggested cellulose-lignin fibres as a promising material, reducing cellulose hydrophilicity by over 80 % and improving thermal degradation behaviour. Notwithstanding, the development of a multifunctional fibre is a work in progress in terms of investigation and improvements to achieve an optimum composition for a high-performance solution.

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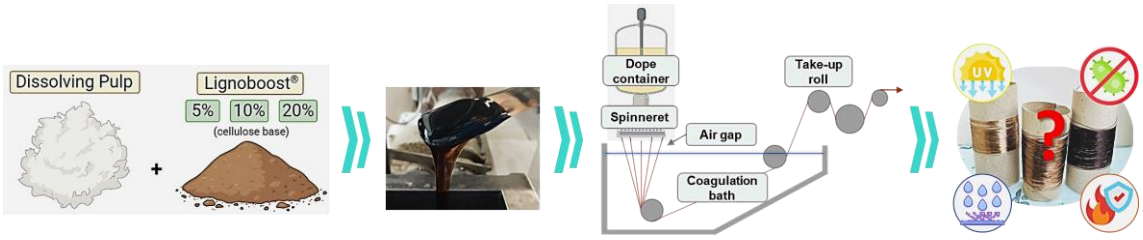

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