

## **A circular economy approach to leather by products valorization towards a zero-waste process**

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The tanning industry, known for its significant waste production, has a great environmental footprint and is one of the main contributors of environmental pollution. To address this concern, this industry has been actively adopting circular economy principles to repurpose the by-products it generates. One of its key focuses is the reutilization of leather by-products, aiming to minimize environmental harm through effective waste management and resource conservation. This strategy shift not only contributes to reducing overall waste but also aligns itself with the 12<sup>nd</sup> UN sustainability goal (Ensure sustainable consumption and production patterns) by the re-use of its own byproducts.

This study focused on exploring different enzymes and hydrolysis conditions for the repurposing of leather byproducts. The objective is to enhance the existing leather industry hydrolysis process, with a primary focus on achieving a more sustainable and circular approach towards the creation of versatile functional coatings within the leather industry. For this purpose, hydrolysis processes using commercial (ProtaBate P) and alternative enzymes (Bromelain and Alcalase) were optimized targeting its reduction from 24 to 6h reactions. Samples MW was determined through SE-HPLC analyses and hydrolysis percentage (TNBS), total protein (BCA) and antioxidant activity (ORAC) were also evaluated.

The results demonstrate that all the enzymes had an effect in the leather by-product. It is also possible to conclude that Alcalase provided a better hydrolysis performance than ProtaBate P and Bromelain. Alcalase had higher hydrolysis percentage (70.12%), MWs between 10 and 50 kDa and a higher antioxidant activity (34.51 vs 32.87  $\mu\text{M}$  Trolox equivalent/mL sample). This study outlines the potential of re-using leather by-products to create versatile functional coatings through a circular and more sustainable process.