

# Eco friendly leather: Energy Dispersive X-Ray Spectroscopy combined with Scanning Electron Microscopy and Thermogravimetric Analysis

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## AIM OF THE PROJECT

Replacement of current commercial chemical and toxic products with innovative natural/naturalized products\* and technologies in the whole tanning cycle (bating, defatting, tanning, fatliquoring and dyeing phases)

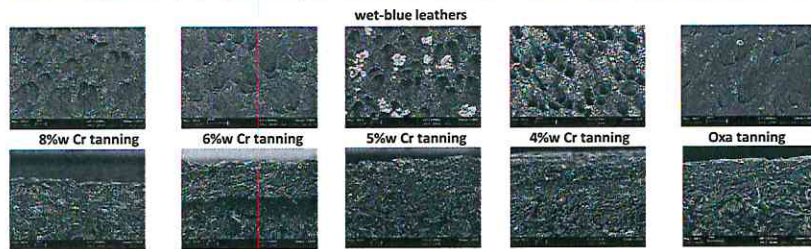
\* often obtained from agro-industrial byproducts

## LIFETAN OBJECTIVES

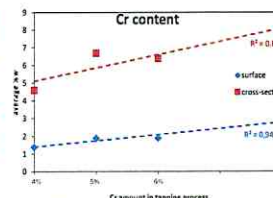
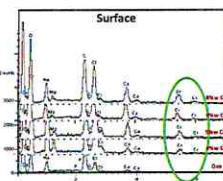
- Using naturalized defatting and fatliquoring products not exceeding the legal limits for hazardous substances in leather goods and with enhanced biodegradability (reducing waste water contamination)
- Recycling poultry waste to obtain technical products for the bating phase
- Designing naturalized dyes
- Developing an innovative Chromium-free tanning technology

## LABORATORY LEVEL

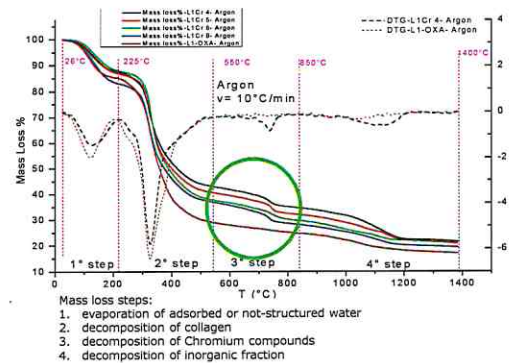
The compatibility of natural products for bating and defatting phase, both with Chromium and Oxazolidine (OXA) tanning, was demonstrated



- ✓ homogeneous pores surface distribution with uniform size and mainly fibrous cross-section with good opening up extent of fibres
- ✓ the use of innovative products and the replacement of Chromium with Oxazolidine did not affect the morphology and not involve significant differences in the composition



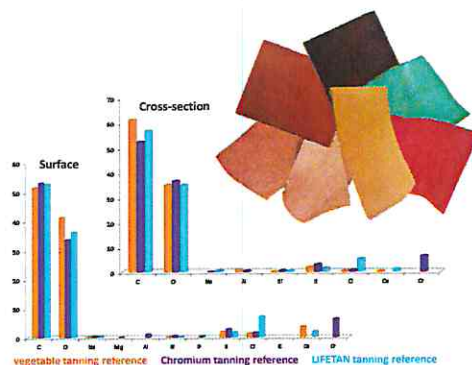
- ✓ the surface and cross-section composition were absolutely comparable (bating, defatting and tanning phases operate uniformly in the leather thickness, mainly in the Oxa tanning)



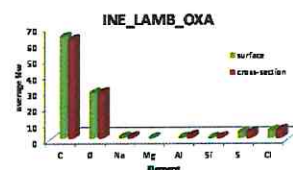
- ✓ all Cr-tanned samples showed the same thermal stability which don't change with Cr percentage (Chromium can be reduced, thanks to the use of natural product in bating and defatting phases)
- ✓ the behavior in temperature of samples processed only by traditional products or natural products is the same

## SEMI AND PRE-INDUSTRIAL LEVEL

The improvement in the whole tanning cycle was evaluated (cow, calf, lamb crust leathers by NEWPORT, INESCOMP and TRADELDA)



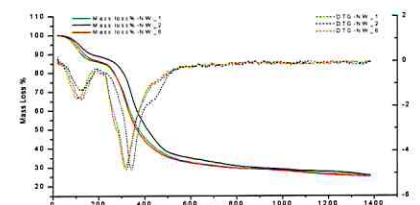
- ✓ better dye penetration in the Oxa-tanned leathers
- ✓ the use of innovative products and the replacement of Cr with Oxa did not significantly affect the morphology
- ✓ comparable composition, both in the surface and cross-section (the only significant differences are an increase of the C amount in the Oxa tanned samples, obviously combined with the absence of Cr content)
- ✓ the Cr-free tanning ensured a better uniformity whatever the hide (almost the same composition on the surface and in the cross-section)



Microanalysis restricted to a limited area along the whole thickness to assess the uniformity of the tanning cycle



The Cr-free tanning allowed to obtain crust leathers with no compositional gradient in the leather thickness from the finished to the rough surface



The tanning phase affects the thermal stability (Cr presence/absence affected the thermogram shape)

## CONCLUSIONS

- The effectiveness of 20% Chromium reduction and/or replacement of standard chemical with natural/naturalized products in the tanning cycle, even reducing the environmental impact of the process, was demonstrated
- These experimental results were also confirmed by Attenuated Total Reflectance Mid-Infrared (ATR-FTIR) Spectroscopy