

# Chromium reduction in an eco friendly tanning cycle

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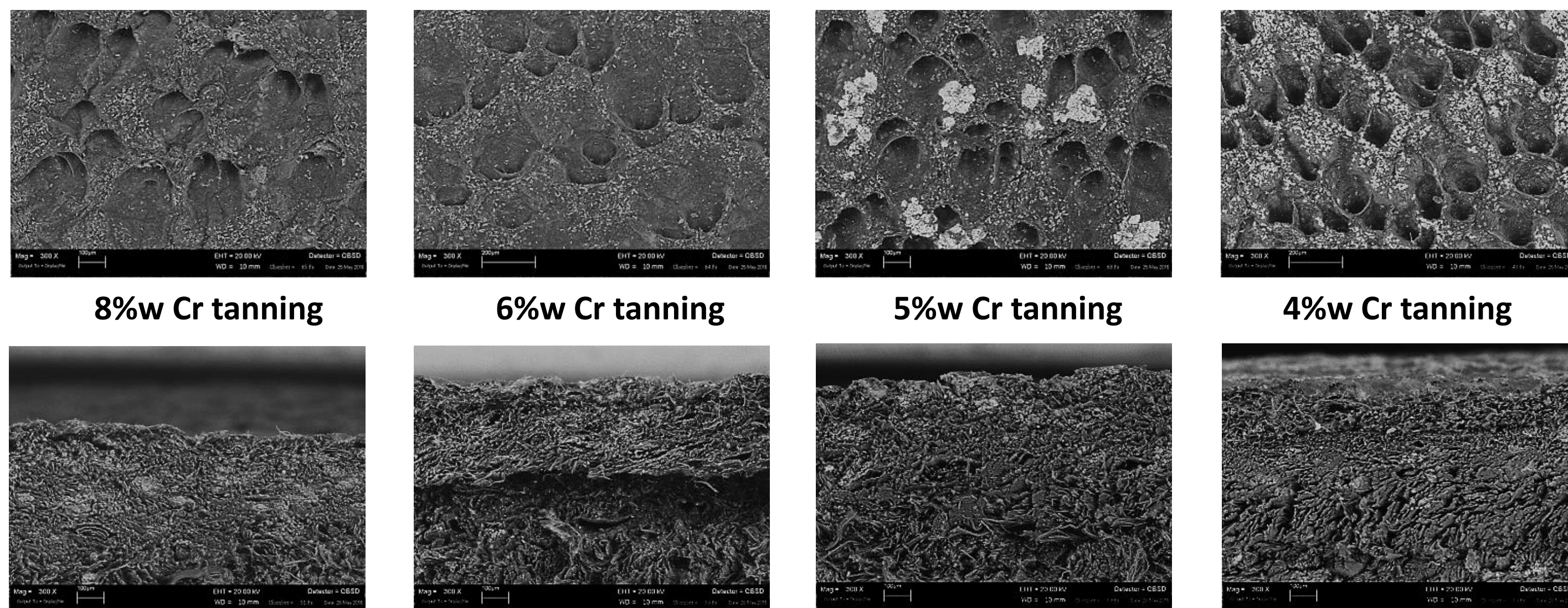
## AIM OF THE WORK

LIFETAN project aims at demonstrating the use of innovative natural/naturalized products in the whole tanning cycle, in a circular economy perspective. The leather manufacturing traditionally induces high environmental pollution since tannery effluent contains large amounts of lime sludge, sulfides, acids, toxic metals salts (mainly Chromium salts) which are toxic, not biodegradable and hardly disposable. Therefore, innovative formulations are defined in the bating and defatting phases, at a laboratory level process, in order to reduce the Chromium amount to develop a significantly eco-sustainable and convenient business for companies and to produce high quality leather products.

## EXPERIMENTAL RESULTS

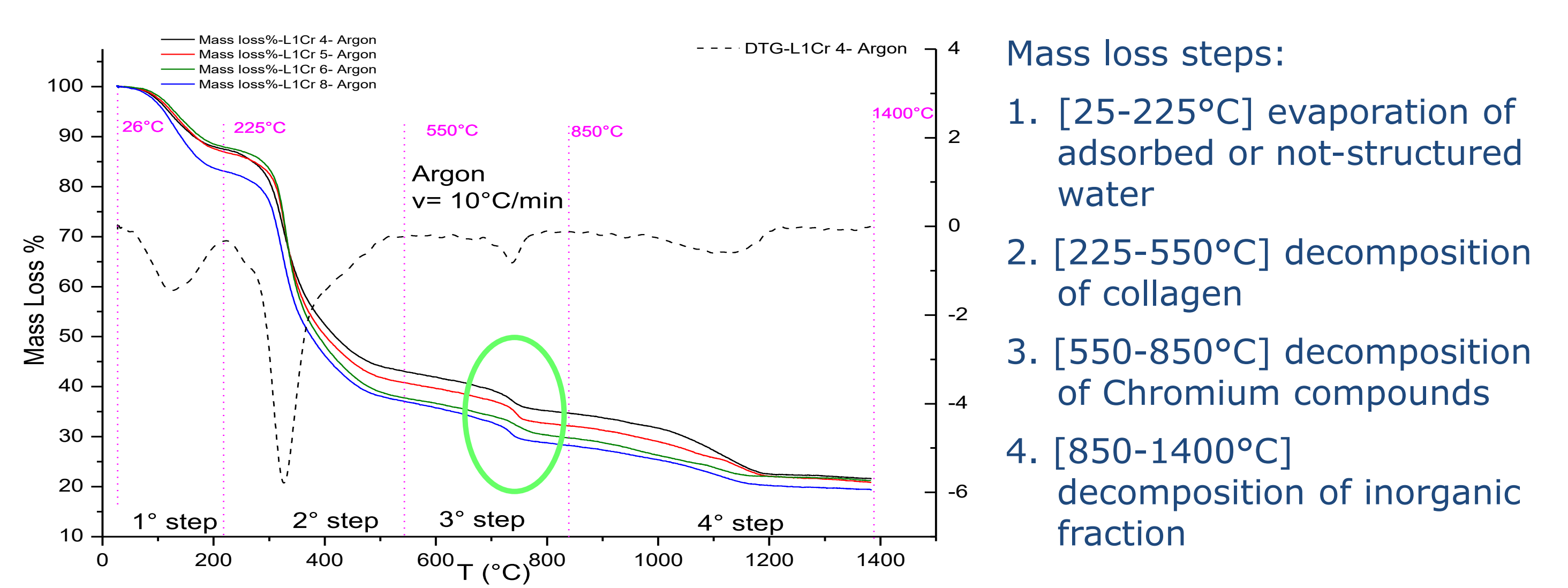
The effectiveness of the replacement of current commercial chemical and toxic products with innovative natural/naturalized products for bating and defatting phase, both with standard (8%w) and reduced Chromium amount, was tested by using the same equipments and labor operations already present in tanneries, with a significant economic benefit.

### Morphology



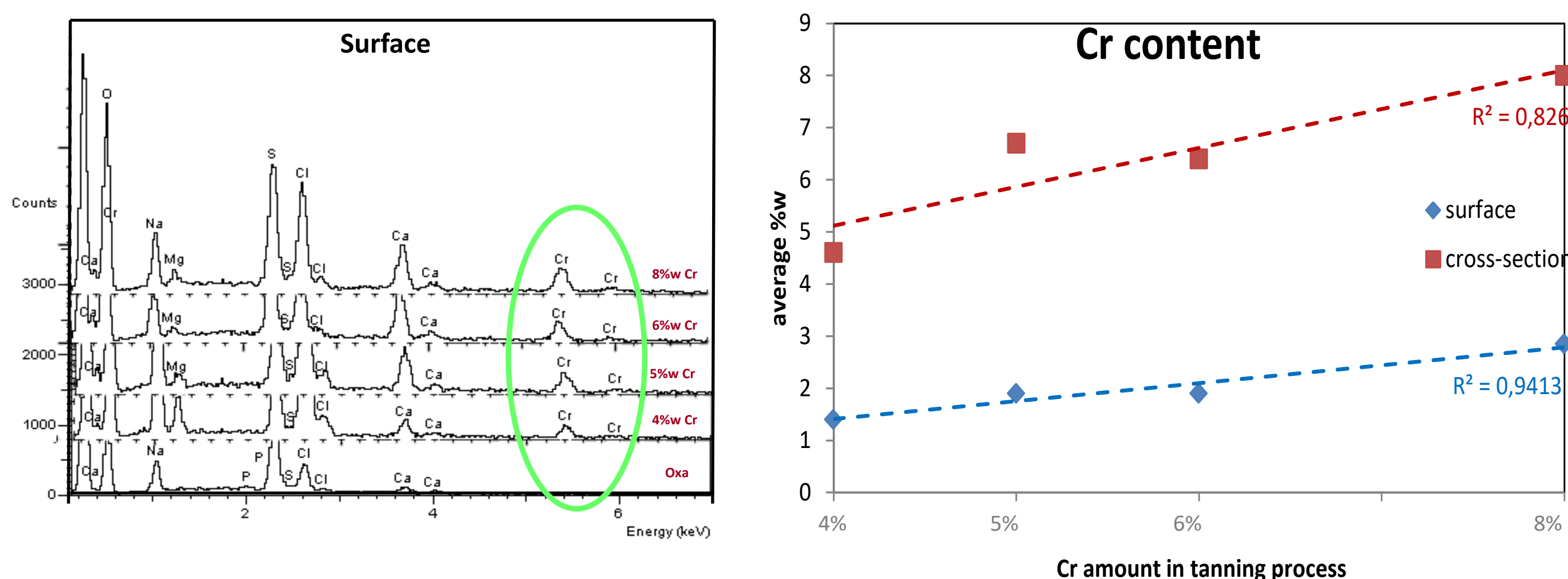
- ✓ homogeneous pores surface distribution with uniform size (some residual salt crystal mainly in the 5% Cr tanned leather) and mainly fibrous cross-section with good opening up extent of fibres (post tanning chemicals can easily penetrate into the fibers network)
- ✓ the Chromium reduction did not affect the leather morphology

### Thermal stability



- ✓ 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

### Microanalysis



- ✓ Cr content decreased congruently with the percentage of Chromium salts used in the tanning phase
- ✓ the surface and cross-section composition were absolutely comparable (bating, defatting and tanning phases operate uniformly in the leather thickness)
- ✓ the Chromium reduction did involve significant differences in the leather composition

### Physical and mechanical properties

	Traditional Bating/Defatting (8% Cr Tanning)	Naturalized/Natural Bating/Defatting (8% Cr Tanning)
<b>Tear strength (N)</b> (reference value >150)	181	149
<b>Tensile strength (N/mm<sup>2</sup>)</b> (reference value >15)	30,4	20,4
<b>Elongation at break (%)</b> (reference value >40%)	56,3	69,7
<b>Shrinkage temperature (°C)</b>	>100	>100

good physical strength and adequate smoothness, softness, fullness and flexibility

### Residual baths

	Bating/Defatting agents	pH	COD (mg/l)	BOD <sub>5</sub> (mg/l)	Biodegradability	TKN (mg/l)	Chromium (mg/l)
Effluents from bating/defatting phases	commercial/commercial	8.64	7300	1387	0.19	1650	---
	naturalized/natural	8.15	14800	5290	0.36	880	---
Effluents from tanning phase (8% Cr)	commercial/commercial	5.09	7700	3120	0.41	---	740
	naturalized/natural	5.25	11500	5260	0.46	---	620

Environmental benefits of using innovative natural/naturalized products in the bating and defatting phases:

- ✓ an increase in biodegradability of 70%, despite higher COD and BOD<sub>5</sub> due to the higher defatting effect and the chemical composition of the defatting product which is a derivate of lactose
- ✓ reduction of the nitrogen content
- ✓ greater chromium fixation to the collagen

## CONCLUSIONS

- The compatibility of replacing traditional with innovative products in the bating and defatting phases, both with standard and reduced Cr content, even reducing the environmental impact of the process, was demonstrated.
- The effectiveness of using lower concentration of Cr salts (20% less), to obtain the same quality of final leather, was successfully proved.