



Leather with high biodegradability: a new step in sustainability

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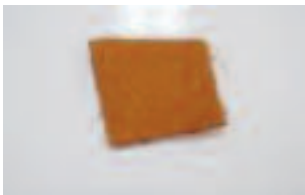
A project named BeNature has been completed based on an aldehyde tannage that has resulted in readily biodegradable leather articles. The consortium for this project includes a tannery – António Nunes de Carvalho, S.A – a university (Faculdade de Ciências e Tecnologia – Universidade Nova de Lisboa), the Portuguese Technological Centre for Leather Industry (CTIC), the Portuguese Technological Centre for Footwear Industry (CTCP), and a footwear manufacturing company - Comforsyst. In addition to creating this new leather, methods were also developed to measure the rate of degradation. Several types of wet-white tanning including heavy-metal-free

systems were produced together with retanning and fatliquoring processes, then assessed for their biodegradability. The findings from some of these investigations are given as *Panel 1*.

This leather, named BiOnature, shows a level of biodegradability that is four times higher than products with a chrome tanning base, and two times higher than other products with a wet-white base. The accumulated consumption of oxygen of the three different samples was also measured as shown in *Panel 2*, with the BiOnature leather showing the greatest oxygen requirement.

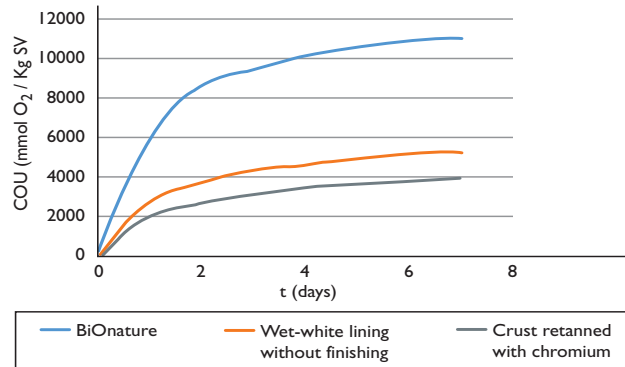
Based on these findings the leather was produced on larger

Panel 1: The disintegration test (ISO 20200:2004)

RETANNAGE			
Time (days)	Chrome	Wet-white metal free	BiOnature
0			
7	 (1)	 (2)	 (4)
14	 (1)	 (2)	 (5)
30	 (2)	 (3)	KEY (1) Good mechanical resistance (2) Reduced mechanical resistance (3) Low mechanical resistance and deformed (4) Low mechanical resistance and part disintegrate (5) Complete disintegration
45	 (3)	 (4)	



Panel 2: The accumulated consumption of oxygen (COU).



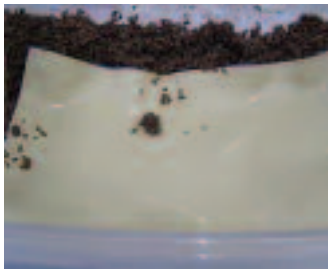
scale, two tests being performed:

- The aerobic biodegradability measured according to ISO standard 14855-1:2005.
- The disintegration degree under composting conditions according to ISO standard 20200:2004. The results are illustrated in *Panel 3*.

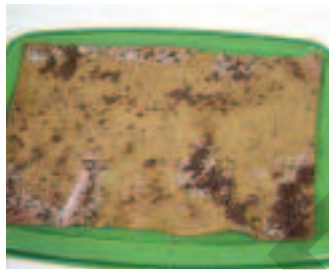
This test was repeated several times and confirmed that under the conditions of ISO standard 20200:2004, the samples are 100% disintegrable, taking only 11-14 days. It is noted that this product also shows a higher biodegradability than cellulose.

This leather was developed approximately one year ago, and the technique has since been adapted commercially as Oak Leather by Carvalhos, Portugal, to create biodegradable leathers that are being used for shoe upper leathers. The disintegration of these shoes over a period of 21 days is shown in *Panel 4*. 🌱

Panel 3: Degree of disintegration of BiOnature leather.



Day 0



Day 7



Day 12



Day 15

Panel 4: Composting of footwear manufactured using BiOnature leathers.



Day 0

This shoe was produced using only biodegradable components. The uppers and linings were made from BiOnature leathers.



Day 7

After 7 days, the shoes shows colour fading, and degradation of the fibre structure for enhanced breakdown under natural composting conditions.



Day 14

After 14 days the degradation of the leather structure is profound.



Day 21

After 21 days the shoe has totally disintegrated.