ICCOM-COLORTEX-ICCOMCNR-SERICHIM-INESCOP

Environmental demonstration of natural products at laboratory level

DELIVERABLE D2

ACTION 4

January 2012–May 2013

LIFE ECOFATTING PROJECT
LIFE10 ENV/IT/000364

ENVIRONMENTALLY FRIENDLY NATURAL PRODUCTS INSTEAD OF CLOROPARAFFINES IN THE FATTING PHASE OF THE TANNING CYCLE

Prepared by ICCOM-CNR-COLORTEX

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LIST OF ABBREVIATIONS

SCP Sulpho Chloro Paraffin
CP Chloro Paraffin
CL Chrome Tanned Leather
GSA Gelatin Sigma type A
GSB Gelatin Sigma type B
CMS chloro Methyl Stearate
MeOH methanol
IPA isopropylic alchol
PEG poly ethylene glycol
TGA Thermo Gravimetric Analysis
DTG Differential Thermo Gravimetry
FTIR Fourier Trasform Infrared Sepctroscopy
COD Chemical Oxygen Demand
BOD Biological Oxygen Demand
VOC Volatile Organic Compounds

COLORTEX and SERICHIM produced standard samples, taking chlorine and chlorosulfonated paraffins as a reference, analyzing and assessing the performances of reference samples.
In particular, COLORTEX produced leathers from bovine and ovicaprine raw hides tanned with standard chrome tanning and fatliquored with a specific formulate containing a defined amount of the natural product CMS38 compared with CP44. The treatment was performed to produce soft nappa and nubuk articles. CMS38 was selected to develop the application test because its physical properties were similar to CP44.
Figures 4.1A and B shows the pictures of samples of chrome tanned leather treated by COLORTEX with CP44 (left) and CMS38 (right) fatliquoring formulation.

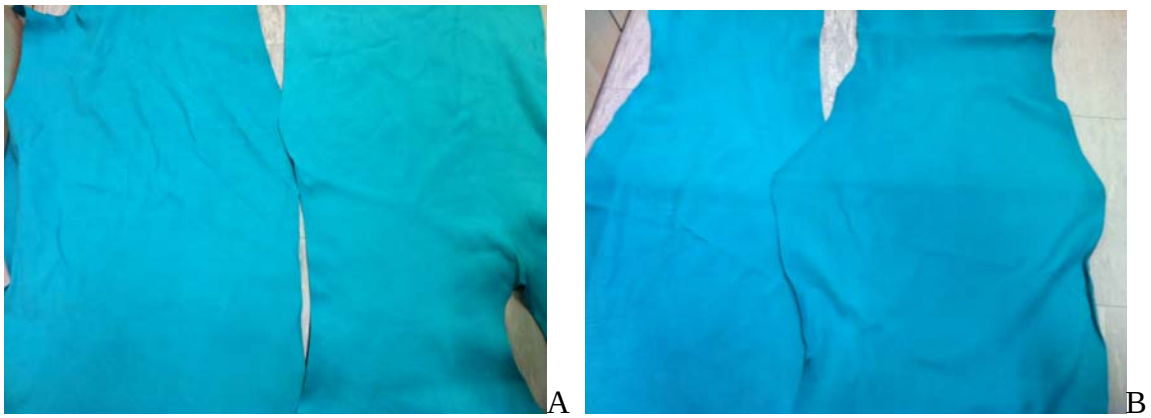


Figure 4.1. Samples of chrome tanned leather treated by COLORTEX with CP44 (left) and CMS38 (right) fatliquoring formulation.

No remarkable differences were observed in FTIR spectra (Figure 4.2). However, some different physical properties (see below) were revealed. This confirms that theoretical assumptions made in the project planning were correct.

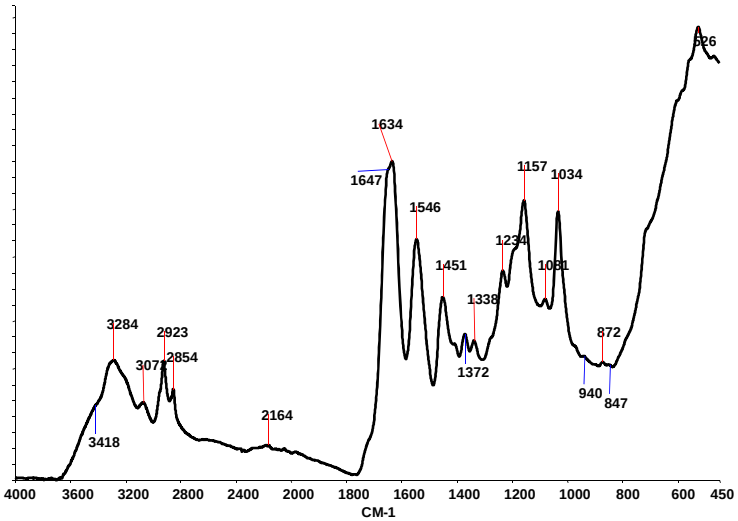
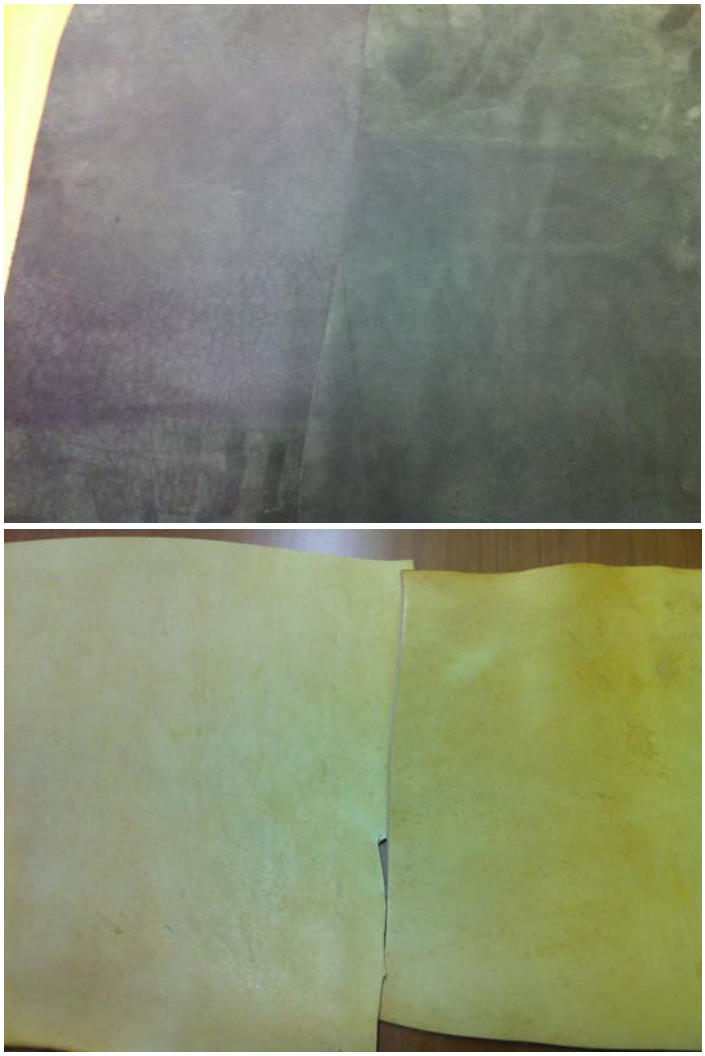


Figure 4.2. Representative FTIR spectrum of SCP tanned leather.

Characteristic bands of sulfamidic bonds at 1338, 1234, 1157, 1034, and 872 cm^{-1} were all related to the formation of thionyl amine bonds. In microanalysis of gelatin treated with SCP

in vitro this bond is sometime hardly recognizable because of the excess of unreacted/adsorbed SCP. This excess is removed from leather after long rinsing in water/surfactant emulsion, but it is not easily removed from treated gelatin due to the solubility of gelatin in water.
The articles obtained were quite similar. The differences observed among CMS38- and CP44-treated samples are the following. CMS38-treated samples were lightly hard, with a oily touch (not so silky), more shining, and they present a better "writing effect" (on nubuk articles), with very good buffing properties.

To better understand the effect of the new naturals products on leather, COLORTEX performed also different trials on chrome tanned leather (Figure 4.3A) and vegetable tanned leather (Figure 4.3B) using CP44 and CMS38 as finishing chemical. In this process the product is applied on leather by using roller coating machine. Due to this application most of the chemicals were localized only on the leather surface.



A

B

Figure 4.3. Chrome tanned leather (A) and vegetable tanned leather (B) treated with CP44 (left) and CMS38 (right) as finishing chemical.

The differences observed on these samples were analogous to those reported above. However, several features were most evident.

On vegetable tanned leather we can observe a reduced “waxy” effect of CMS38.
This effect can be explained on the basis of FTIR results (see Action 3) that showed that an highest chlorine content improves the interaction with the protein matrix. Thus, a reduced Cl percentage in CMS38 compared with CP44 may increase the penetration of this chemical through the section of treated leather, which is responsible for the reduced “oily” surface.

Figure 4.4 shows the picture of two representative leathers fatted with the natural product Cl-Palmkernel oil FAME, selected for the production of leather products (right in the picture) and with CP44 (left in the picture).

Figure 4.4. Picture of two representative leathers fatted with the natural product Cl-Palmkernel oil FAME, selected for the production of leather products (right in the picture) and with CP44 (left in the picture).

The articles obtained were quite similar, although the Cl-Palkernel oil FAME fatted leather were even better.

The natural product formulations defined in the previous action for the fatting phase have been optimized and demonstrated in a lab-scale tanning process (small drums), in order to achieve a product characterization for leather samples obtained with the new formulations used in the fatting phase. The performances of the tested samples have been compared to the results obtained from reference samples, obtaining very good results.