



European Union  
European Regional  
Development Fund

Integrated fashion project for eco-sustainability products

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# Sustainability and textile industry

## Water consuming

At least 40 are required to produce 1 kg of textile.

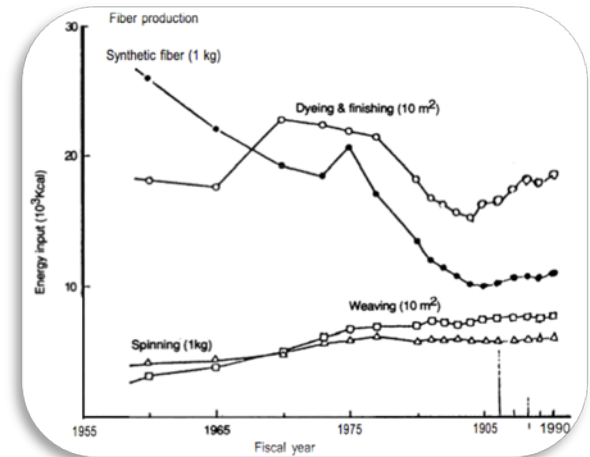
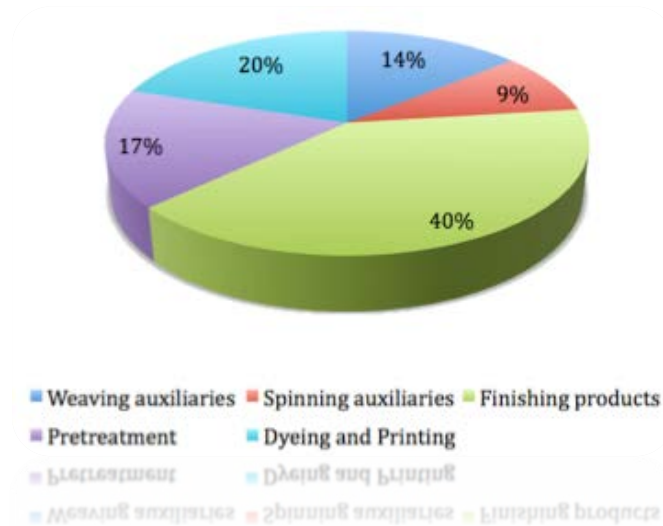
## Chemical consuming

About 60 million tonnes of fibres and 6 million tonnes/year of chemical auxiliaries are consumed (source Chemical Finishing)

## Energy consuming

Around 30 Tjoule per year (source UNIDO Japan)

Processing subcategory	Water consumption, L/kg production
Yarn and fabric forming	0
Slashing	0.5-7.8
Preparation	
Singeing	0
Desizing	2.5-20
Scouring	19-43
Continuous bleaching	2.5-120
Mercerizing	1.0
Dyeing	
Beam	170
Beck	230
Jet	200
Jig	100
Paddle	290
Skein	250
Stock	170
Pad-batch	17
Package	180
Continuous bleaching	170
Indigo dyeing	8.3-50
Printing	25
Print afterwashing	110
Finishing	
Chemical	5.0
Mechanical	0





PIMECO project aimed to realise products with high technological content and low level of environmental impact thanks to the combination of experiences and technology gained in different areas of fashion: textiles, tanning, footwear and furniture.

The final goal of the project was to break down the manufacturing systems barriers in order to share the know-how and the various skills of the different sectors that compose the fashion industry. Through the combination of the data from the different sectors, it has been possible to get products that fully meet the market needs in terms of eco-sustainability.

Studies carried out by the Research Centers of the Fashion Pole OTIR2020 have highlighted the following possibilities:

- leather "plus": anti-static, water-repellent and resistant to dirty;
- non-slip shoe-leather;
- products with special effects that currently are made only on hides and that are unknown to the textile sector;
- applications for the modelling footwear that optimizes the thermo-physiological comfort level.

# pimeco



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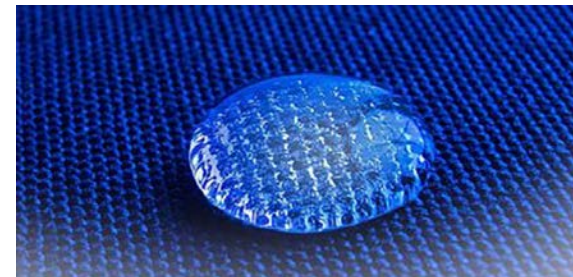
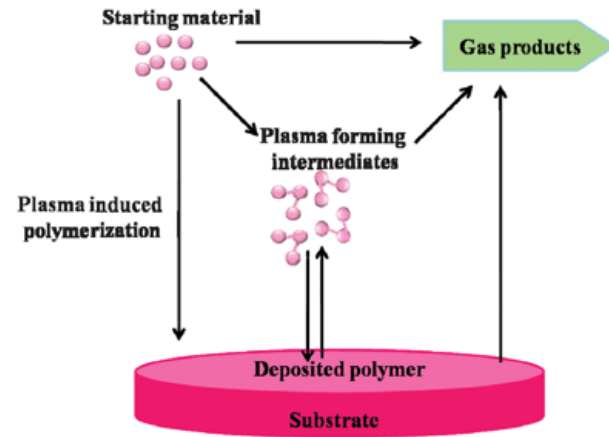
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*Prove- Tarature - Ricerca applicata*  
*Trasferimento tecnologico*

# Plasma technology as innovative method for leather functionalization

## Leather

- removal of thin surface layers of material, with cleaning effect and conferring of a greater uniformity (etching)
- insertion on the surface of atoms or chemicals (grafting)
- deposit of thin layers of metals or polymers
- chemical activation of the surface by breaking of chemical bonds and generation of free radicals
- the spontaneous formation of new chemical bonds, without insertion of reactive compounds



# Plasma technology as innovative method for leather functionalization

## Footwear

- antibacterial properties
- oil-repellency
- water repellency associated with breathability
- stain
- improve the adhesion to the dyes
- increase resistance to pilling
- increase the resistance to felting
- improve adhesion to adhesives

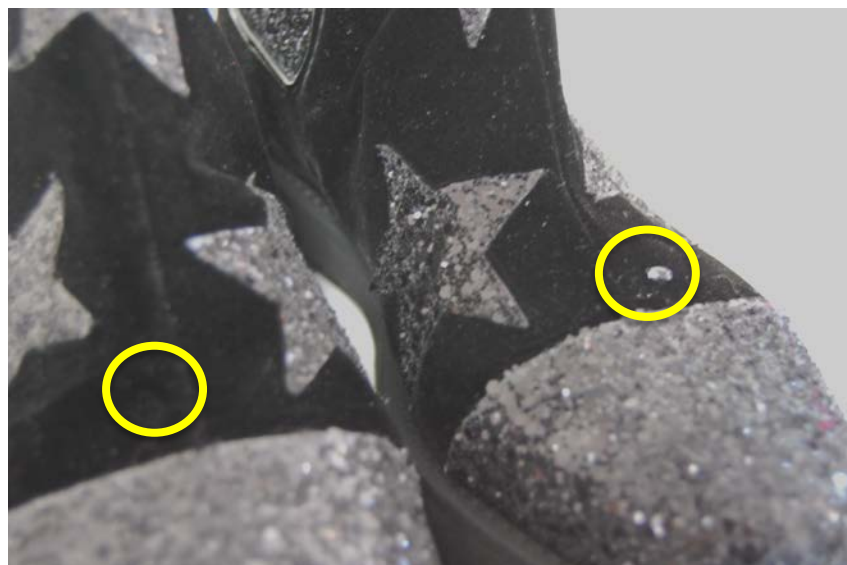


# Cold plasma treatment

## *Water & Oil repellency*

		Water	Oil
<b>FABRIC</b>	Not treated	1	0
	Treated	3	3/4

		Water	Oil
<b>LEATHER</b>	Not treated	0	0
	Treated	4/5	3/4



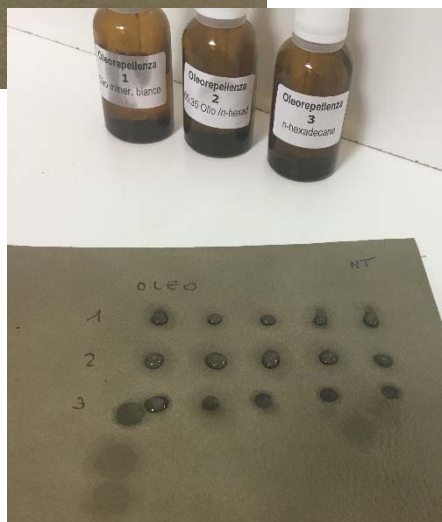
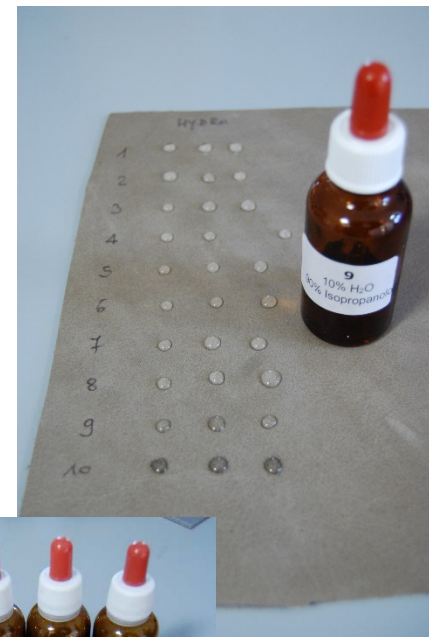
# Cold plasma treatment

*Surface activation and functionalization reaction by grafting with a monomer which confers water repellency characteristics*

## WATER REPELLENCY OF LEATHER FOR FURNITURE

Not Treated  
Value 1,5

Treated  
Value 9



## WATER REPELLENCY OF LEATHER FOR FURNITURE

Not Treated  
Value 0,5



Treated  
Value 3,5



# Cold plasma treatment

## LIQUID REPELLENCY OF LEATHER FOR FURNITURE (8 tests)



- 1-CocaCola
- 2-Lemon juice
- 3-Blueberry juice
- 4-Red wine
- 5-Olive oil
- 6-Cherry jam
- 7-Coffe
- 8-Beer

A disk of absorbent paper is soaked in the liquid "fouling", and then resting on the surface so as to wet it and maintained for the test time, protected by the evaporation with an overturned petri dish.

An exception is the jam which is directly supported on the surface since it is already semi-solid and not absorbed by the paper.

After the test time (6 hours in this case) absorbent paper has been used to dry the surface, and then washed with soap and water and then dries without rubbing.



RFSET

# Cold plasma treatment

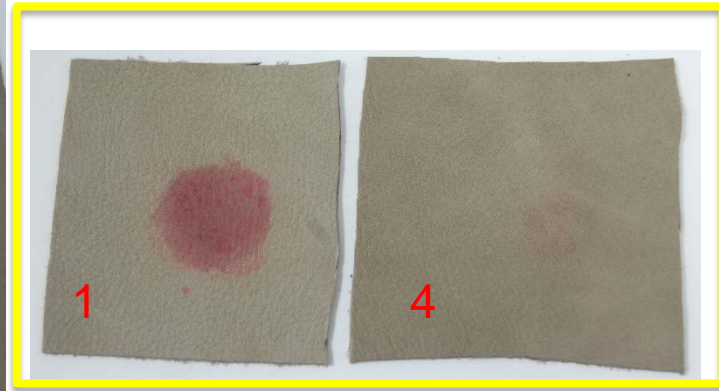
NOT TREATED



TREATED



Dye: Red SANODAL B3LW SANDOZ (acid red 331) sol. 10g/L



# Cold plasma treatment

Leather type	<i>Coca Cola</i>	<i>Succo di limone</i>	<i>Succo di mirtillo nero</i>	<i>Vino rosso</i>	<i>Olio di oliva</i>	<i>Marmell. di ciliegie</i>	<i>Caffè</i>	<i>Birra</i>
<b>TORTORA Not treated</b>	<b>1</b>	<b>1/2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>TORTORA treated</b>	<b>5</b>	<b>5</b>	<b>4/5</b>	<b>5</b>	<b>5</b>	<b>4/5</b>	<b>4/5</b>	<b>5</b>

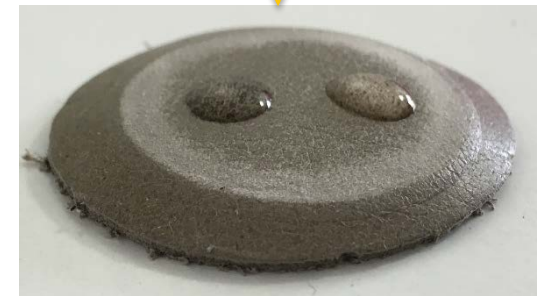
Good cleaning properties of plasma treated leather



# Cold plasma treatment

Water & Oil repellency on plasma treated leather after abrasion test

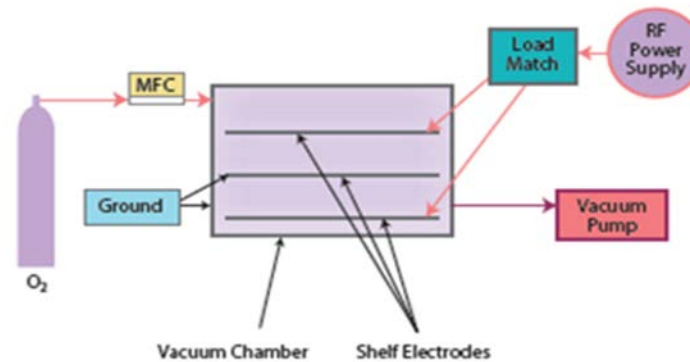
Water		Oil
1,5	Not treated	0,5
9	Treated	3,5
2,5	Martindale abrasion test 12.800 cycles	1,5



# Advantages

## Environmental impact

- Dry process (water saving)
- Avoid the use of chemicals for materials functionalization



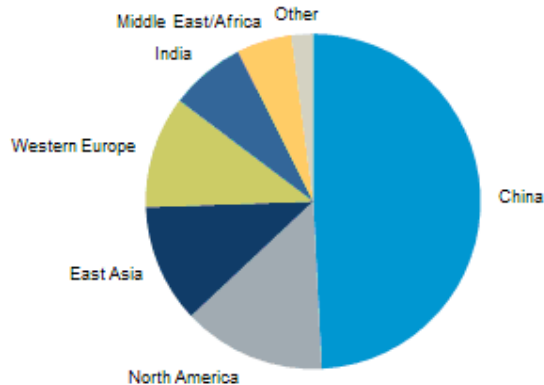
## Comfort

Excellent hydrophilic characteristics, humidity transport, breathability and drying speed, absorption indices / release (skin model)

# Sustainability and textile industry



World consumption of textile chemicals—2015





# RESET

Interreg Europe



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# Thank you!

Questions welcome



*Project smedia*