20th UITIC
INTERNATIONAL TECHNICAL FOOTWEAR CONGRESS

Porto 2018
16th–18th MAY

FROM FASHION TO FACTORY
A New Technological Age

Functional Leathers by MLSE® Laser Plasma Technology

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INESCOP
REDIT INNOVATION NETWORK

Leather sustainability

Sustainability is a crucial factor for the viability of the entire leather industry

The environmental impact of the leather industry is clearly a high concern for the most dynamic, most prestigious and innovative BRANDS

The challenge

A major CHALLENGE for the leather industry today is the introduction of INNOVATIVE and more RESOURCE EFFICIENT processes to REDUCE or avoid the use of WATER, ENERGY, hazardous CHEMICALS and WASTE.

- Ethical Sourcing
- European Legislation
- Reduction of environmental impact

Leather sustainability

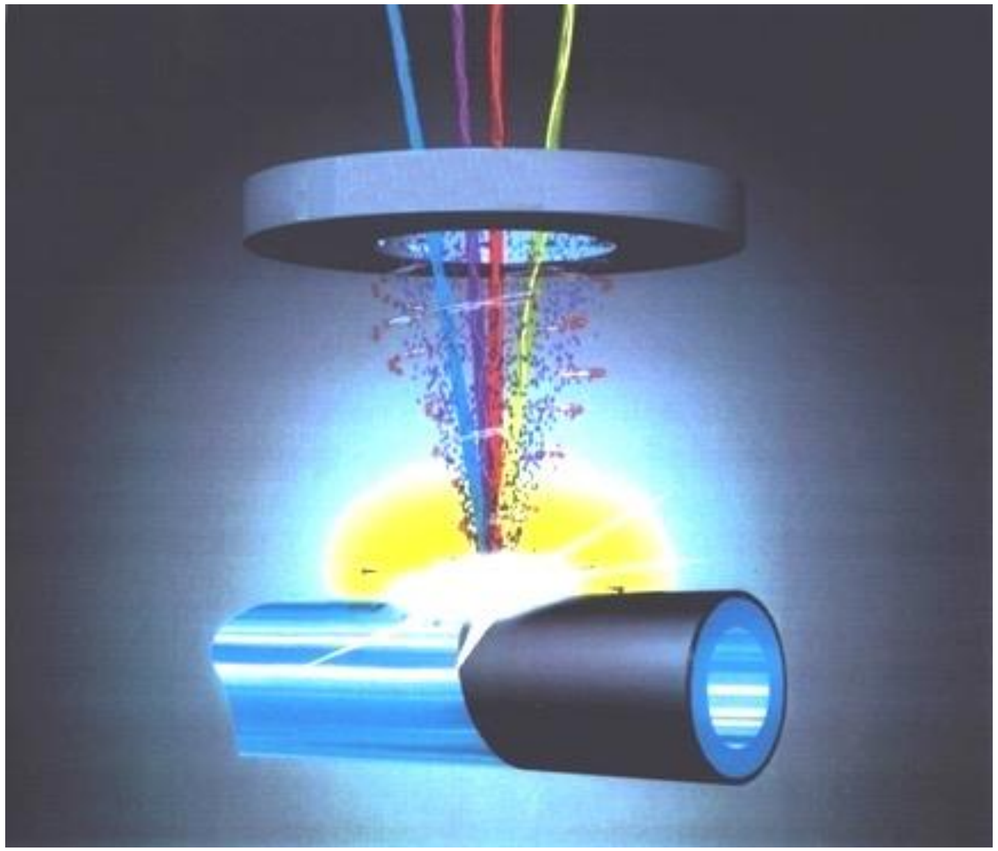
Conventional treatments

- Halogenated organic compounds (PFCs, …)
- Organophosphorous
- Biocides

REACH
Biocides Legislation

INNOVATION FOR A MORE SUSTAINABLE INDUSTRY

Multiple Laser Surface Enhancement (MLSE®) technology



MLSE® TECHNOLOGY

Multiple energy sources (laser and high frequency plasma) brought together in the presence of environmental gases (N_2, O_2, Ar, CO_2, …) and precursors to effect structural and chemical changes in the surface of the substrate

mlse®

IMPROVED MATERIAL & FUNCTIONAL PROPERTIES

Multiple Laser Surface Enhancement (MLSE®) technology

PRODUCTION SYSTEM

MLSE® TECHNOLOGY

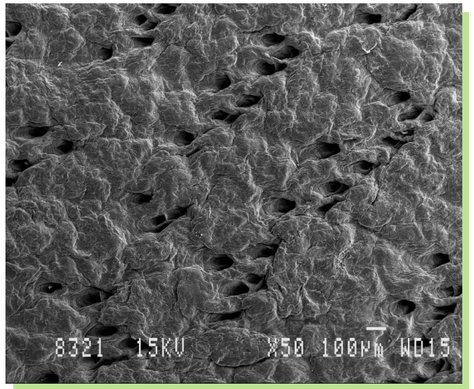
- Materials processed dry
- Atmospheric pressure
- Applicable to all fabrics
- Complete process control & management
- Environmentally friendly
- Possibility of multifunctional treatments (up to 4)

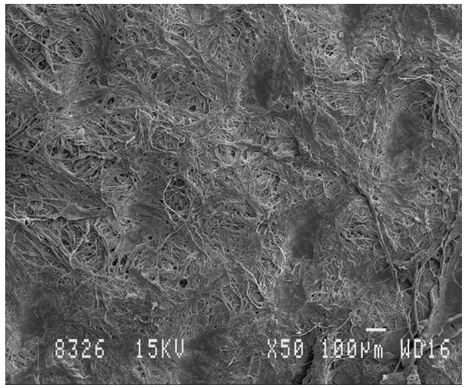
BUT

The MLSE® system is designed to run continuous web, woven fabrics. To run any single, discrete piece structure such as leather hide is still a CHALLENGE

MLSE® adaptation for leather treatment

- KEY PARAMETERS
  - Leathers are **discrete items**.
  - Differences in **thickness.** Besides, thickness along the piece might be **uneven**
  - Animal origin, mechanical finishing and side of treatment (grain or flesh) affect structure
  - Chrome-tanned leathers: MLSE must not oxidise Cr(III) to Cr(VI)

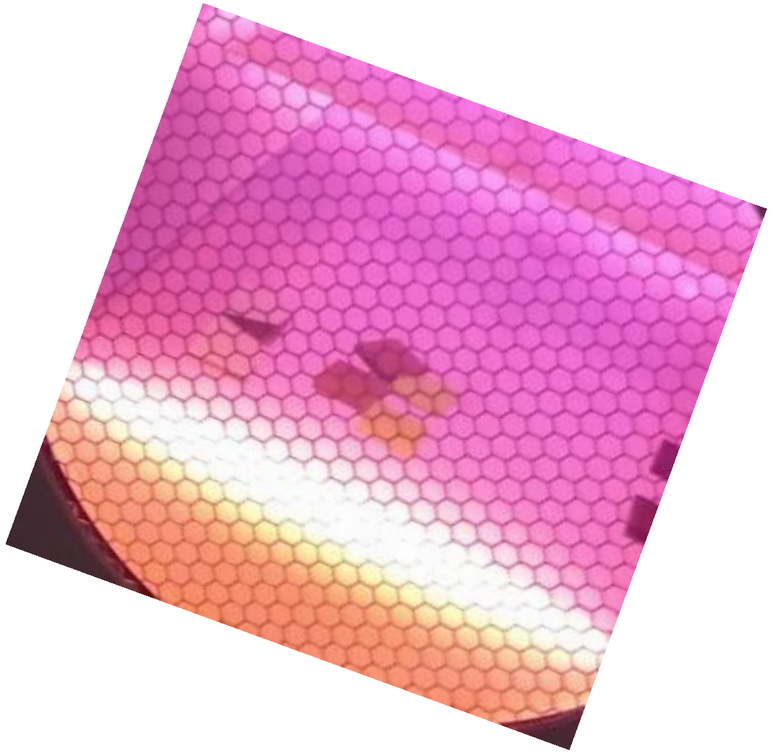




MLSE technology

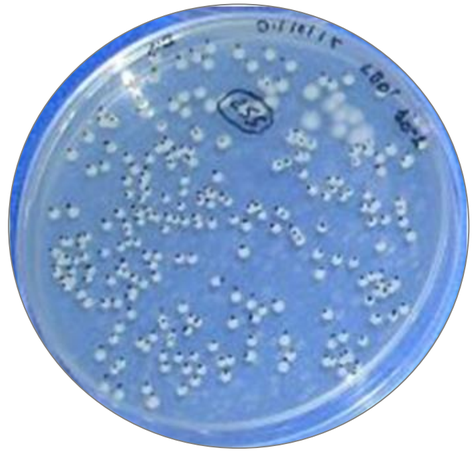
Optimisation of MLSE process to obtain functional properties:

- Precursor: composition and concentration
- Energy sources
  - **Laser:** - Wavelength
    - Frequency
    - Power
  - **Plasma:** - Power
    - Pressure
    - Gases: composition, concentration, flow rate
- Time of residence (speed)

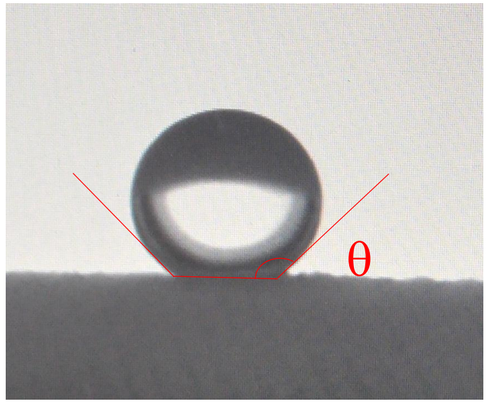


Leather Performance Enhancement

RESULTS TO DATE



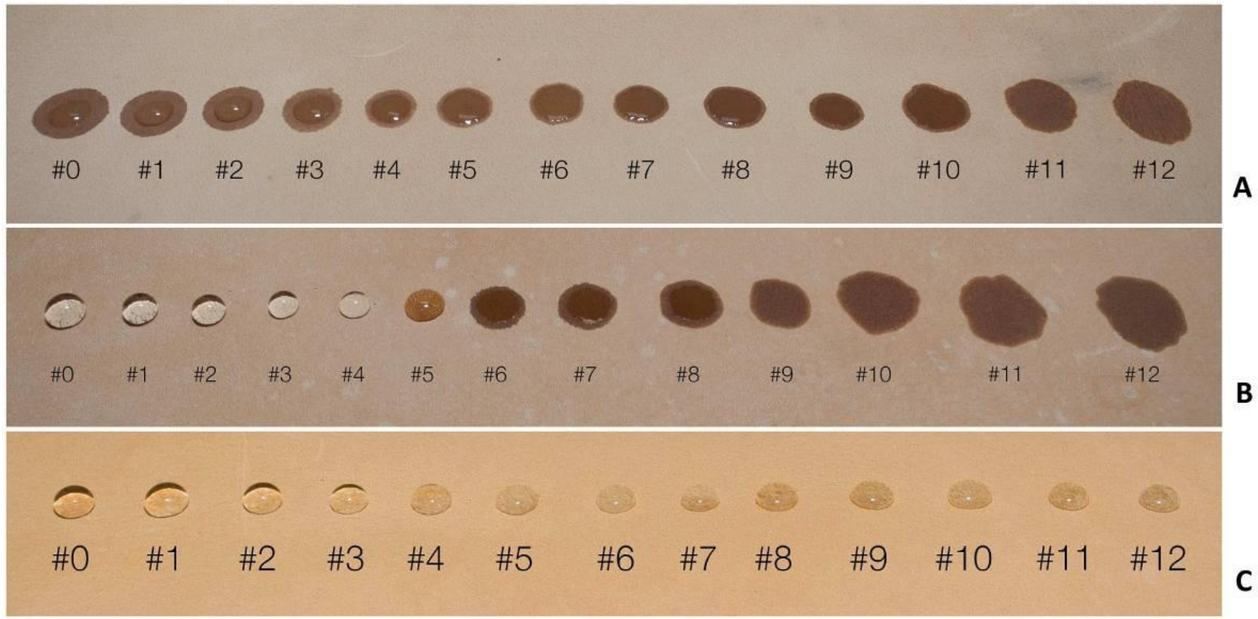
Water repellency properties



Contact angle > 130º

HIGH HYDROPHOBICITY

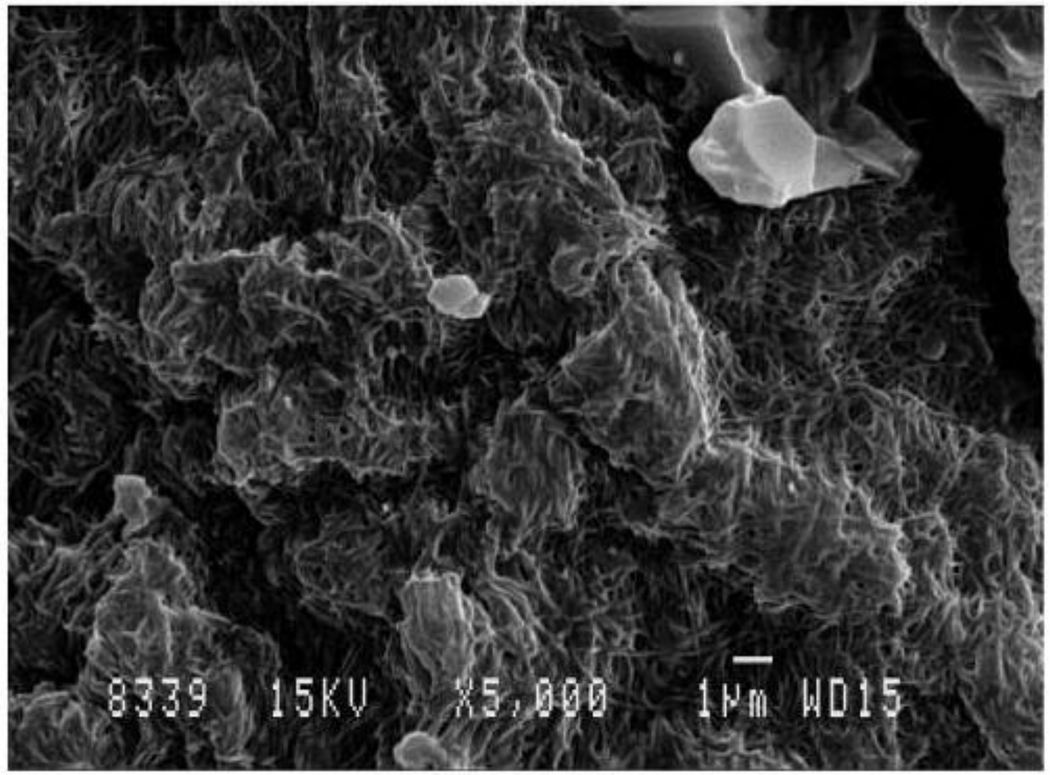
Aqueous liquid repellency (ISO 23232)



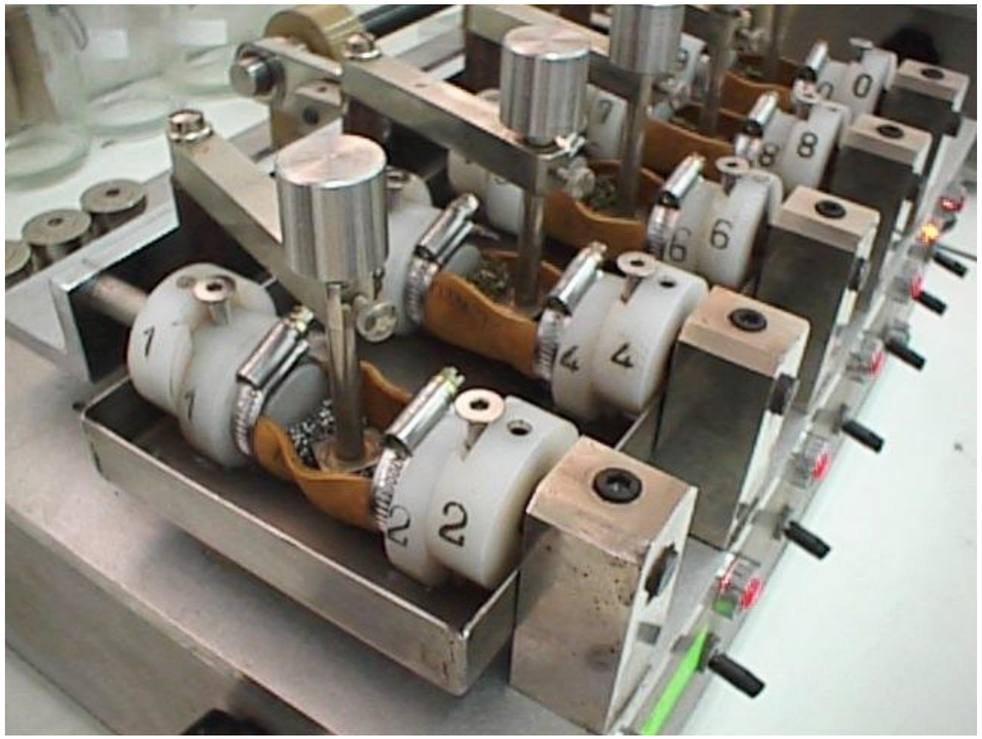
A: *Blank.* ***B:*** *Conventional treatment.* ***C:*** *MLSE*

Water repellency properties

Water repellency is based on a nanostructure that enables the *Lotus effect*



Water repellency properties

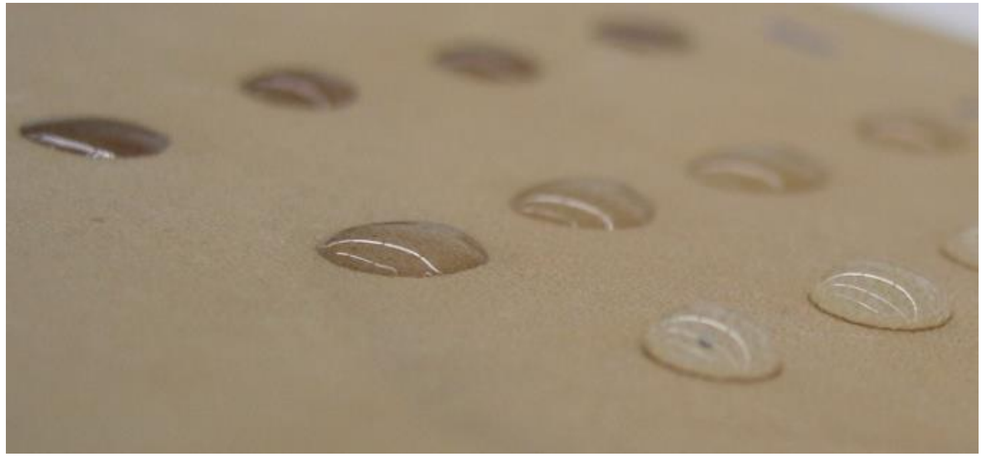


Water resistance in dynamic conditions (EN ISO 5403-1)

- **Penetration time > 60 min**
- **Absorbed water < 30%**

MLSE® treatment does not significantly modify the water vapour permeability of processed leathers

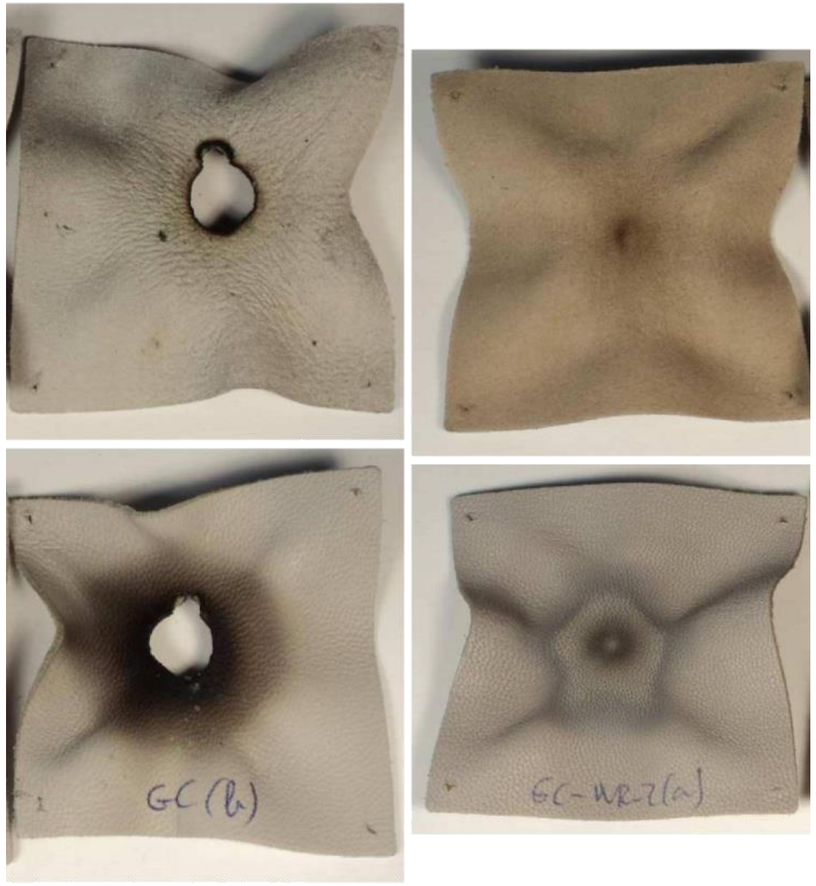
Stain resistance properties



Oil repellency – Hydrocarbon resistance test (EN ISO 14419-1)

- **Up to Grade 7 (Grade 8 max)**

Fire resistance properties

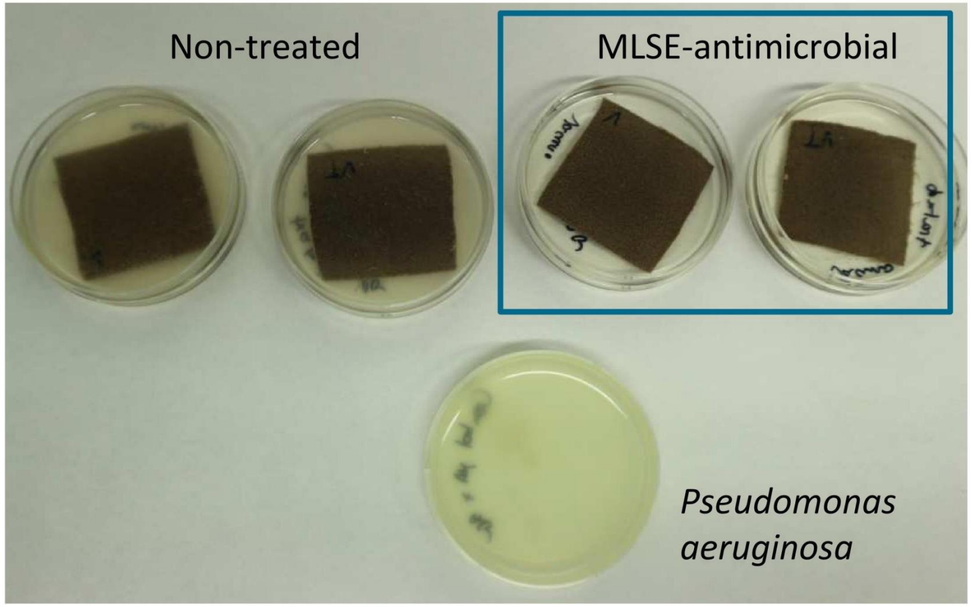


BLANK **MLSE TREATED**

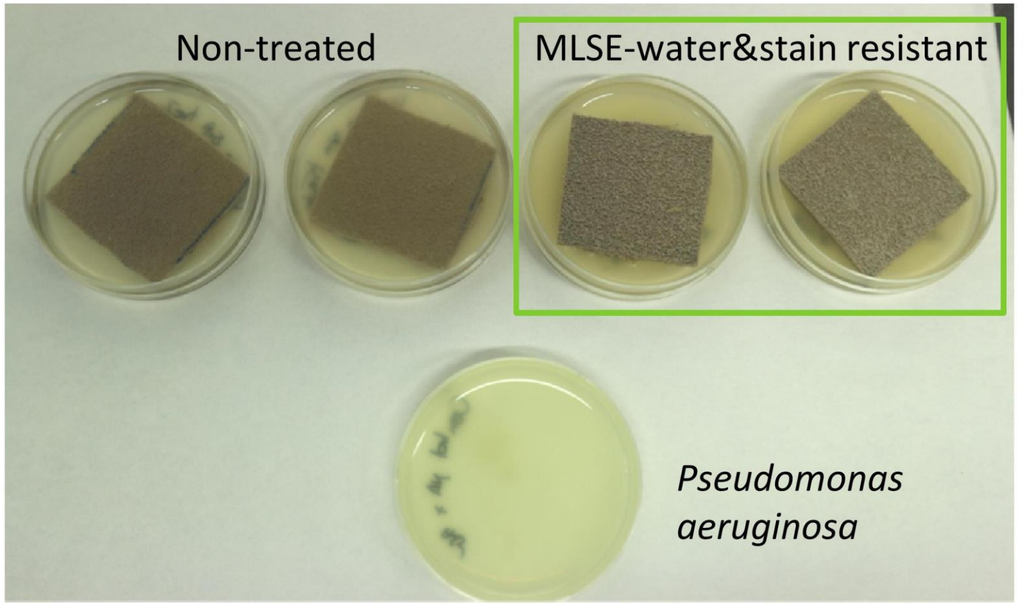
Fire resistance – *Firefighters footwear (EN 15090)*

- **Flame persistance time ≤ 2s**
- **Glow time ≤ 2s**

Antimicrobial properties



Improved antimicrobial properties

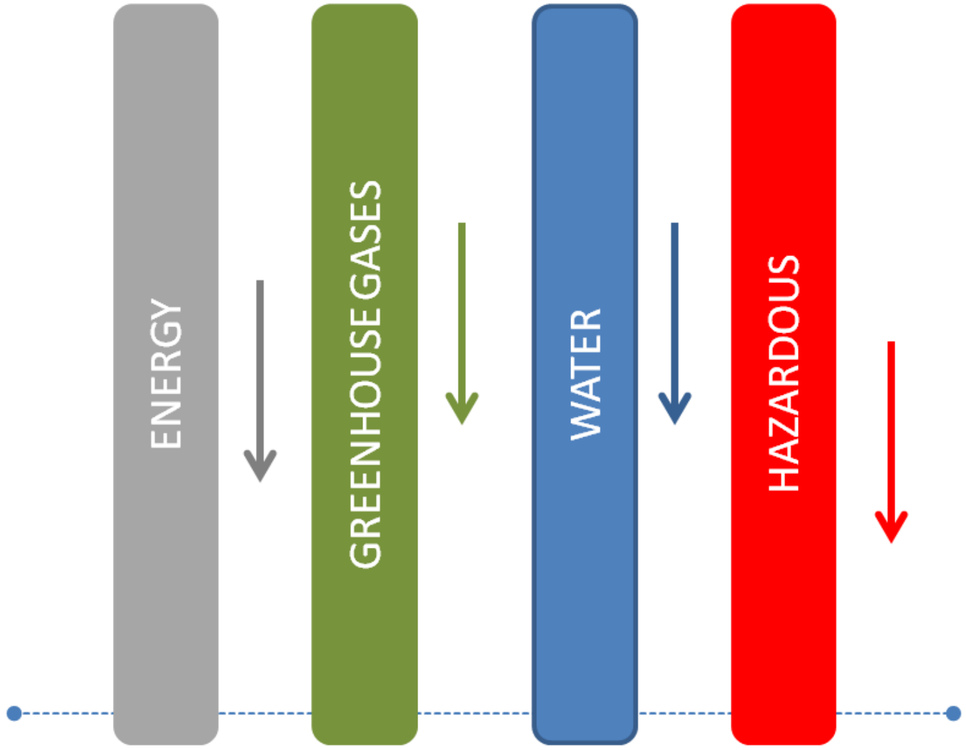


Bacterial biofilm formation is avoided

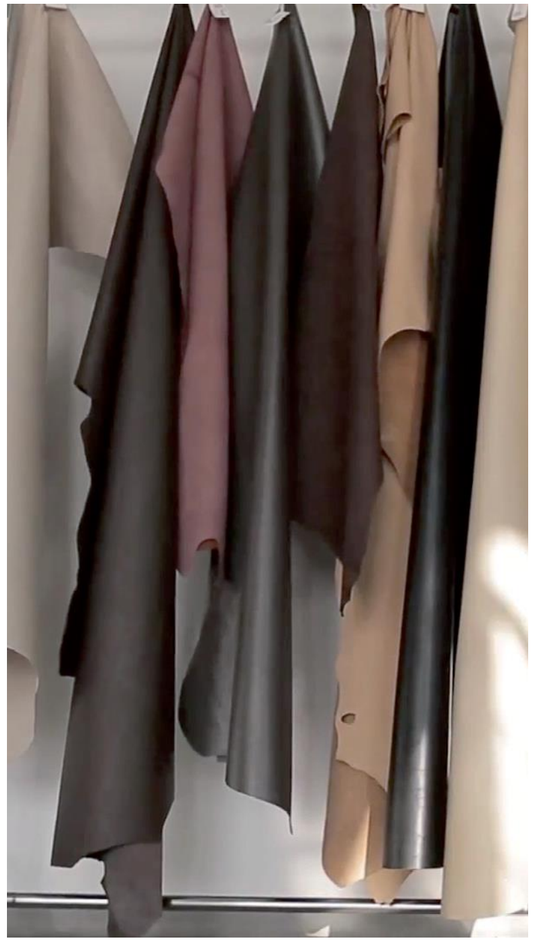
Validation

Good performance of MLSE® treated leathers during footwear manufacturing trials

Environmental benefits



General conclusions



- Promising results on leather performance enhancement
- Adaptation of the current MLSE ®system is needed for leather treatment
- MLSE® is an innovative, eco-effective and more resource efficient process that eliminates the use of hazardous chemicals (i.e. PFCs) and reduces water and energy consumption
- MLSE® process contributes to meeting increasingly more demanding European legislation

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REDIT INNOVATION NETWORK

Thank you for your attention!

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ctcp Portuguese Footwear Technological Centre | APICCAPS Portuguese Footwear, Components and Leather Goods Manufacturers' Association | UITIC INTERNATIONAL UNION OF SHOE INDUSTRY TECHNICIANS