

Cooperation within the area of functional finishing

Dissemination conference of FP7-REGPOT-2008-1-229801:T-Pot project

Zagreb, 16th February 2012



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LEITAT Technological Center

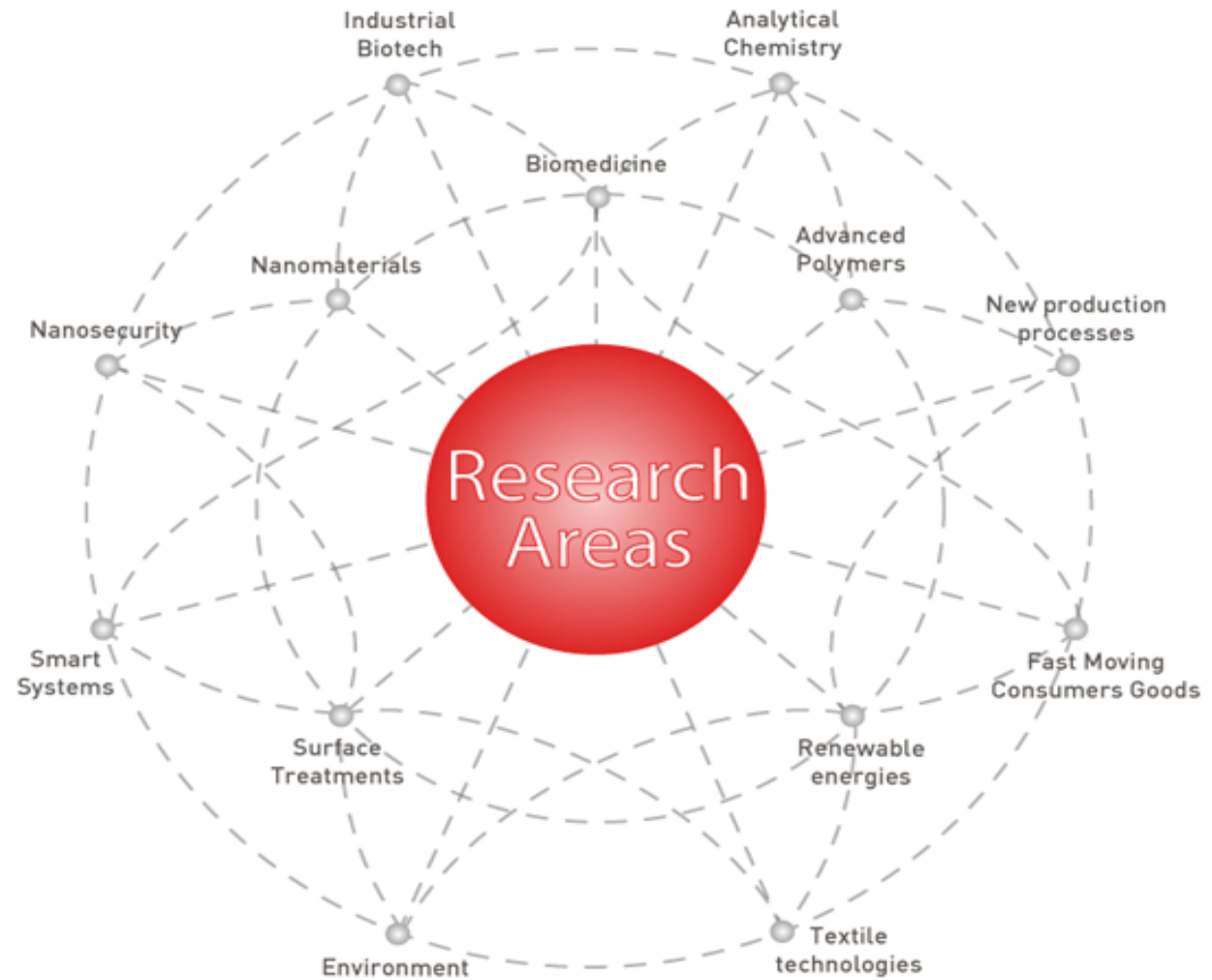
LEITAT Technological Center (founded in 1906) is a member of TECNIO and is recognized by the Ministry of Science and Innovation. Our objective is to collaborate with companies and institutions by adding a technological value to products as to processes, and to concentrate our activities in research, development and industrial innovation (I+D+2i).





LEITAT Technological Center

Research areas





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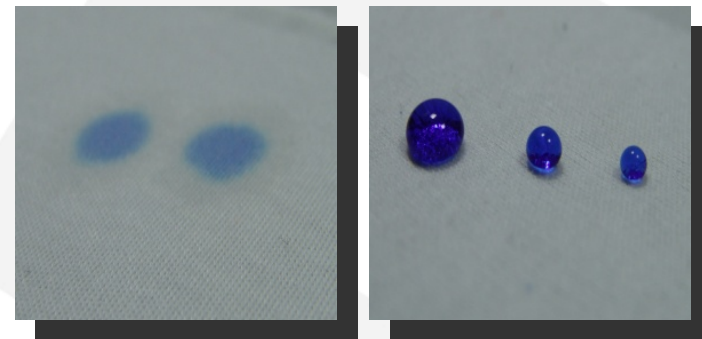
- **Informative sessions realized in LEITAT:**
 - Innovative textile finishing (Roshan Paul)
 - Plasma technology applied to textiles (Llorenç Bautista)
 - Advances in smart textiles (Laurent Aubouy)
 - Technical textiles (Javier Jimenez)
 - Eco-design (Marta Escamilla)
 - Biotechnology in textile sector (Meritxell De la Varga)
- **Time period:** 17-19 June 2009
- **Assistants:** 9 from universities / 3 from companies.



Practical sessions

Within Surface Treatments group:

- Atmospheric pressure plasma treatments to confer hydrophilic properties to textiles.
- Low-pressure plasma treatments (PECVD) to confer super hydrophobic properties to textiles.





Practical sessions

Within Textile Technologies group:

- Digital printing of CO fabric.
- Microcapsules application by pad dry process on PES/CO fabric.
- Photochromic finishing applied by screen printing on CO fabric.
- Phosphorescent finishing applied by screen printing on CO fabric.
- Hydrophobic finishing applied by pad dry process on CO fabric.
- Metalized pigments applied by screen printing on CO fabric.





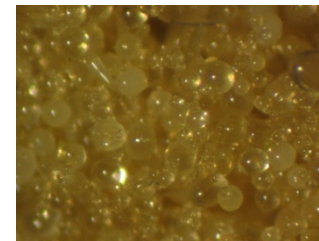
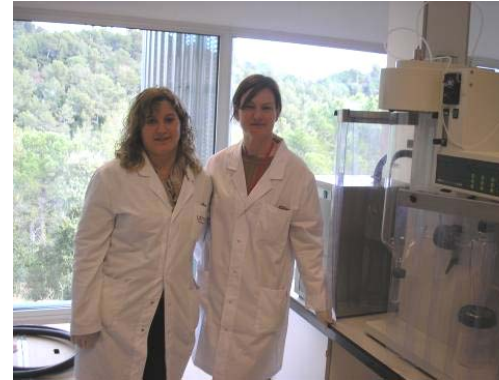
Stay of Dr. Sanja ERCEGOVIĆ RAŽIĆ in LEITAT within Surface Treatments group

- **Research activities carried out:**
 - Low pressure plasma treatments to activate the surface of cellulosic textiles (cotton, lyocell, modal) at different operational conditions (time of treatment, power of discharge, type of gas, etc.).
 - PECVD processes to deposit acrylic-based nanocoatings onto the surface of cellulosic textiles at different operational conditions (time of treatment, power of discharge, type of gas, etc.).
 - Chemical surface analysis of plasma-treated textiles by FTIR-ATR.
 - Wettability analysis of plasma-treated textiles by drop test and contact angle.
 - Study of the ageing effects associated to textile surfaces modified by plasma treatments.
- **Stay period:** June – August 2009



Stay of Dr. Antoneta TOMLJENVIĆ in LEITAT within Textile Technologies group

- **Research activities carried out:**
 - Development of chitosan microsphere for its incorporation in textiles.
 - Incorporation of thermochromic pigments inside PLA polymer by extrusion.
 - Informative sessions on ECO-Label, LCA, Textile R&D and Textile Testing.
- **Stay period:**
 - From 28th February 2011 to 18th March 2011.





Stay of Moisès Moròn in University of Zagreb within Faculty of Textile Technology

- **Research activities to be carried out:**
 - Selection of materials (cotton and cotton blends).
 - FR treatments.
 - Testing:
 - TGA: Thermogravimetric Analyser
 - FTIR: Fourier Transform Infrared Spectroscopy
 - LOI: Limiting Oxygen Index
 - MCC: Microscale Combustion Calorimeter
 - FE-SEM: Field Emission Scanning Electron Microscope.
- **Stay period:** 20-24 February 2012.



FE-SEM



TGA



LOI



MCC



FTIR



- **Oral presentations:**
 - A Tool Box to Catalyze Continuous Process INNOVation within the TEXTile Manufacturing Lines in Europe (INNOTEX), Esteve, Helena et al., presented by Mota, Jordi in Workshop on The Role of Innovations, in Particular for Textile/Clothing and ICT Sectors, Zagreb, Croatia, 21-23 September 2009.
 - How to Innovate for Textile Sector? Esteve, Helena et al., presented by Mota, Jordi in Workshop on The Role of Innovations, in Particular for Textile/Clothing and ICT Sectors, Zagreb, Croatia, 21-23 September 2009.



Poster:

Nanotechnology for UV protection, Paul, Roshan et al., presented in 3rd International Scientific-Professional Symposium: Textile Science and Economy, Zagreb, Croatia, 22 January 2010.

Books:

-Young Scientists in the Protective Textiles Research, Bischof Vukušić, Sandra ; Katović, Drago, University of Zagreb, Faculty of Textile Technology, 2011, ISBN: 978-953-7105-41-9. (**Chapter Review**).

- Protective Texties, Bischof Vukušić, Sandra, University of Zagreb, Faculty of Textile Technology, 2012. (**Chapter Contribution**).



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Cooperation within CIP-Eco Innovation

CIP-Eco Innovation program

- **CIP Eco Innovation objective** is to support projects oriented to the market for the development of eco-innovative techniques, products or processes.
- **The main priority areas of the call are:**
 - **Materials recycling**
 - To improve the quality of recycling materials.
 - To create innovative products using recycled material.
 - To strengthen the competitiveness of recycling industries.
 - Sustainable building products
 - Food and drink sector
 - Water
 - Greening businesses



Cooperation within EUROSTARS and FP7 NMP

EUROSTARS Program

- **EUROSTARS objective** is to provide funding for market-oriented research and development with the active participation of small and medium-sized enterprises (R&D-performing SMEs).

FP7 NMP Program

- Cooperation within NMP.2013.2.3-1 Advanced materials (draft)
- Objective:
To present new materials and how they will help creating in Europe and world-wide an industrial economy that serves citizens better and is more favorable to the environment.

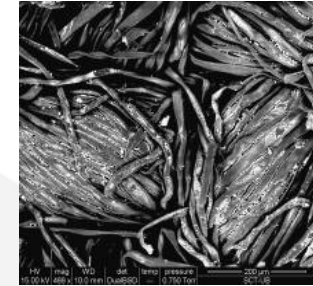


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- **ULTRAVIOLET (UV) PROTECTIVE TEXTILES:**

UV protective nano-finishing by means of titanium dioxide (TiO_2) sol-gel.



*Textile finished with
 TiO_2 sol-gel*

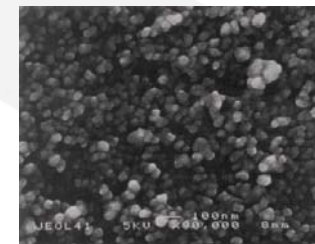
- **LOTUS EFFECT TEXTILES (ULTRA HYDROPHOBICITY):**

Highly hydrophobic effect by means of nanoparticles, plasma, sol-gel or finish applications.



- **SELF CLEANING TEXTILES:**

Self cleaning effect by means of TiO_2 nanoparticles application. Stain disappearance under sun light, by photo catalysis.

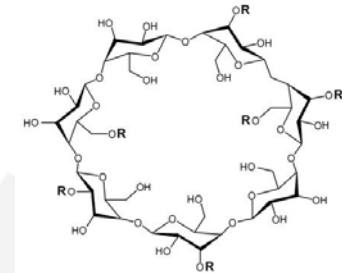


TiO_2 nanoparticles

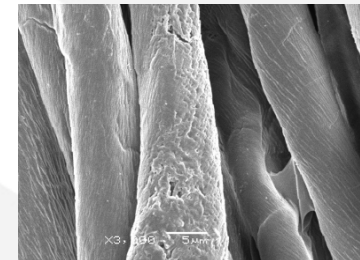


ECO-TREATMENTS

- **ANTI ODOUR TEXTILES:** Anti odour eco finishing applied on textiles by means of cyclodextrins, which are able to capture odours and store perfumes, medicines, etc. in their structure.
- **ANTIMICROBIAL TEXTILES:** Antimicrobial eco finishing applied on textiles by means of chitosan treatment, a product obtained from the shell of crustaceans.
- **INTUMESCENT FLAME RETARDANTS:** Textile finishing with expandable graphite. Expandable graphite is an intumescent product which is able to expand itself when heated.



Chemical representation of cyclodextrin



Textile coated with cyclodextrins



Nonwoven treated with expandable graphite



ECO-TREATMENTS



Yarn dyed with natural dye



Residual lime trimming produced by the leather industry



Different fractions of hydrolyzed protein

- **TEXTILES DYED WITH NATURAL MORDENTS AND DYES:** Development of ecological textiles, dyed by means of natural mordents and dyes, instead of using synthetic dyes and metallic mordents, which are harmful to the environment.
- **TEXTILE DYEING INCORPORATING HYDROLYZED PROTEIN:** Development of ecological textiles by adding a natural product, hydrolyzed protein, in the dyebath with the aim to improve the dyeing yield and to reduce the effluents.
- **OPTICAL BRIGHTENING INCORPORATING HYDROLYZED PROTEIN:** Development of optically brightened textiles by pre-treating with hydrolyzed protein, with the aim to improve the whitening effect and to reduce the effluents.



COTTON BIO-FINISHING:

Biological and ecological cotton desizing, scouring and bleaching by enzymatic treatment, at low temperature and without using any chemicals.

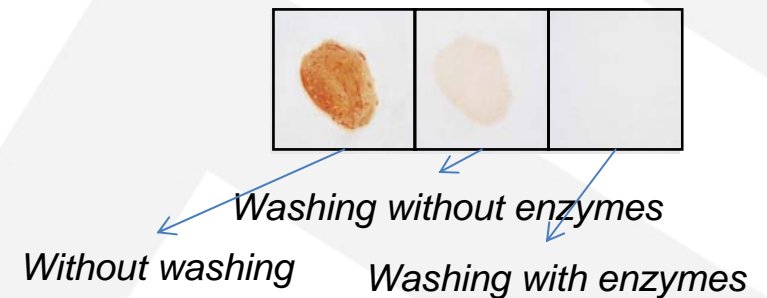


Cotton bio finishing

HYDROPHILIC AND EASY-CARE BIO FINISHING:

Development of hydrophilic cotton textile by means of enzymes.

Improvement of cotton cleaning by washing it with a detergent containing enzymes.





PLASMA TREATMENT

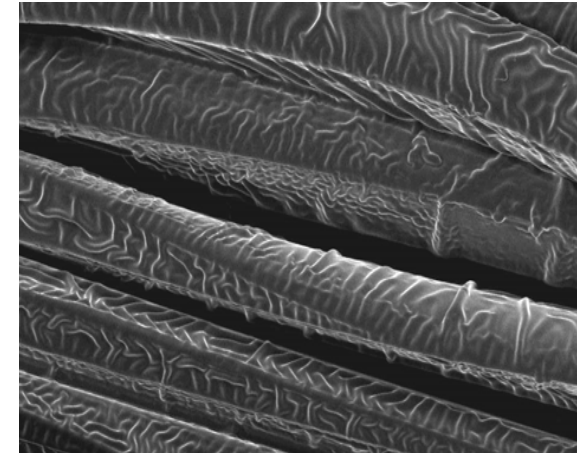
PLASMA ACTIVATION:

Physical modification: roughness.

→ Improves fixation of finishing products and dyes with the fiber.

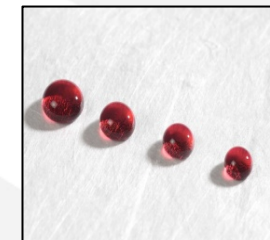
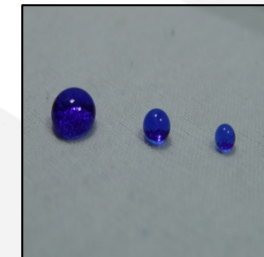
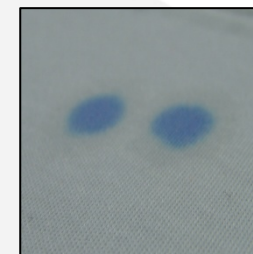
Chemical modification: new functional groups.

→ Improves absorption of finishing products and dyes.



PLASMA-ENHANCED CHEMICAL VAPOUR DEPOSITION (PECVD): *nano-coating.*

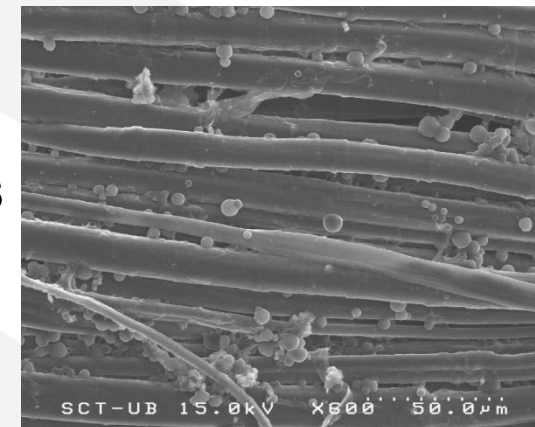
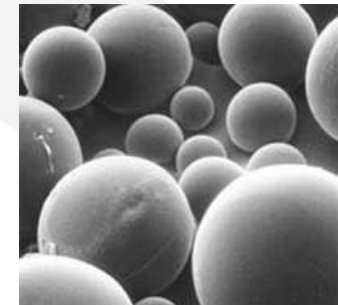
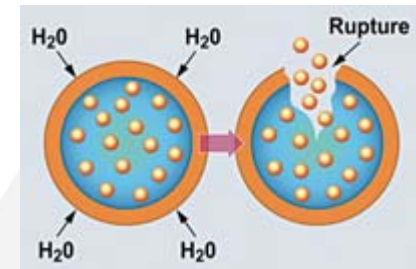
- Hydrophilicity.
- Hydrophobicity.
- Oleophobicity.
- Other properties (antimicrobial, UV protection, flame retardant, antistatic, etc.).





MICROENCAPSULATION

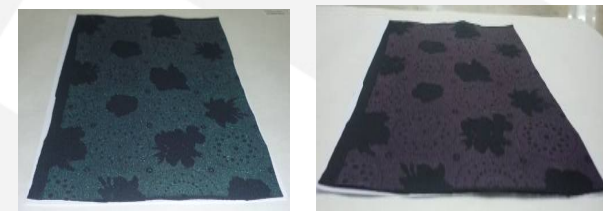
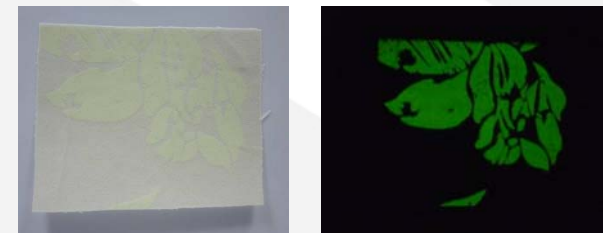
- **MICROCAPSULES DEVELOPMENT WITH NEW PROPERTIES**
 - Perfume microcapsules (jasmine, strawberry, orange, vanilla, apple, etc.).
 - Anti mosquito .
 - Moisturizers.
 - Anti-stress agents (lavender).
 - Anti odour.
 - PCM (Phase Change Materials).
- **MICROENCAPSULATION METHODS**
 - By microemulsion.
 - By dispersion.
 - By interfacial polymerization, etc.
- **MICROCAPSULES APPLICATION ON TEXTILE SUBSTRATES**
 - Pad batch process.
 - Exhaustion process.
 - Spray process.





SPECIAL PIGMENTS

- **THERMOCHROMIC TEXTILES:** Thermochromic textiles in which colour disappears when temperature rises and reappears when temperature falls.
- **PHOTOCHROMIC TEXTILES:** Photochromic textiles capable of changing colour with the light.
- **PHOSPHORESCENT TEXTILES:** Phosphorescent textiles capable of absorbing the light, storing it and re-emitting a part of it in the dark.
- **OPTICALLY VARIABLE (OV) TEXTILES:** OV textiles which are able to change colour according to the angle of vision of the observer.



THANK YOU FOR YOUR ATTENTION

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