La tecnologia sol-gel applicata ai finissaggi tessili

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PRESENTAZIONI TECNOLOGIA SOL-GEL
(6 comunicazioni orali; 2 poster)

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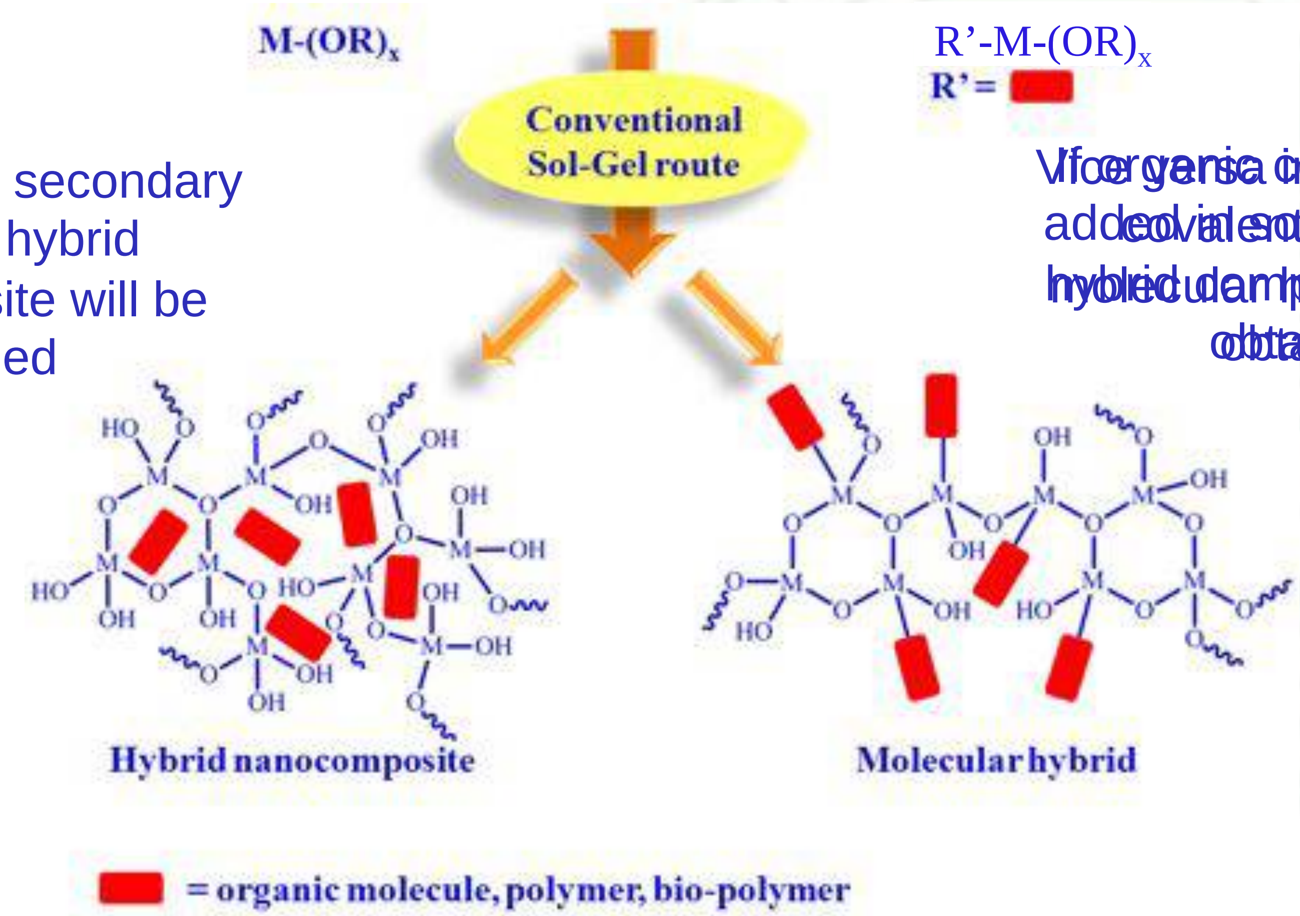
LA TECNOLOGIA SOL-GEL

HYBRID ORGANIC-INORGANIC CHEMICALS

In presence of secondary bonds an hybrid nanocomposite will be realized

If organic component is added in sol solution, an hybrid compound will be obtained.

Vice versa in presence of covalent bonds a molecular hybrid will be obtained.

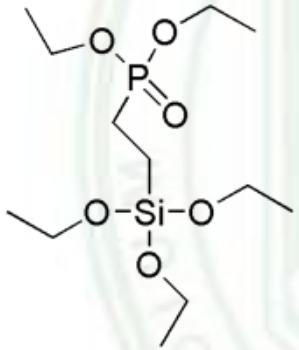


PRESENTAZIONE PL-14

Rosace: Synthesis and characterization of hybrid phosphorus-silica films for halogen-free flame retardant cotton fabrics

1) Influence of catalyst (DBTA: dibutyltindiacetate) and n°of layers

2) Influence of the pre-hydrolysis



DPTS

3) Influence of N-donor molecules

4) Synergisms of P- and N-donor molecules

Four parameters influencing flame retardancy

PRESENTAZIONE PL-14

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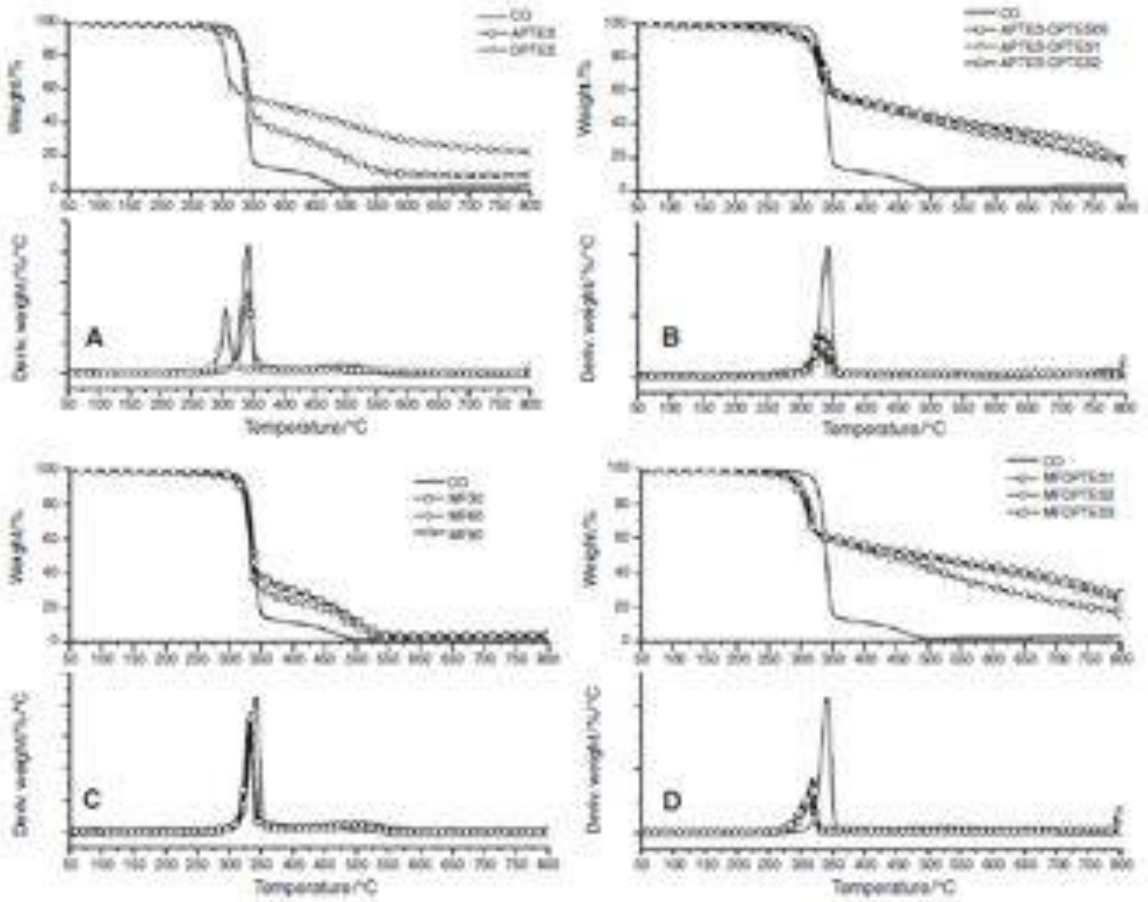

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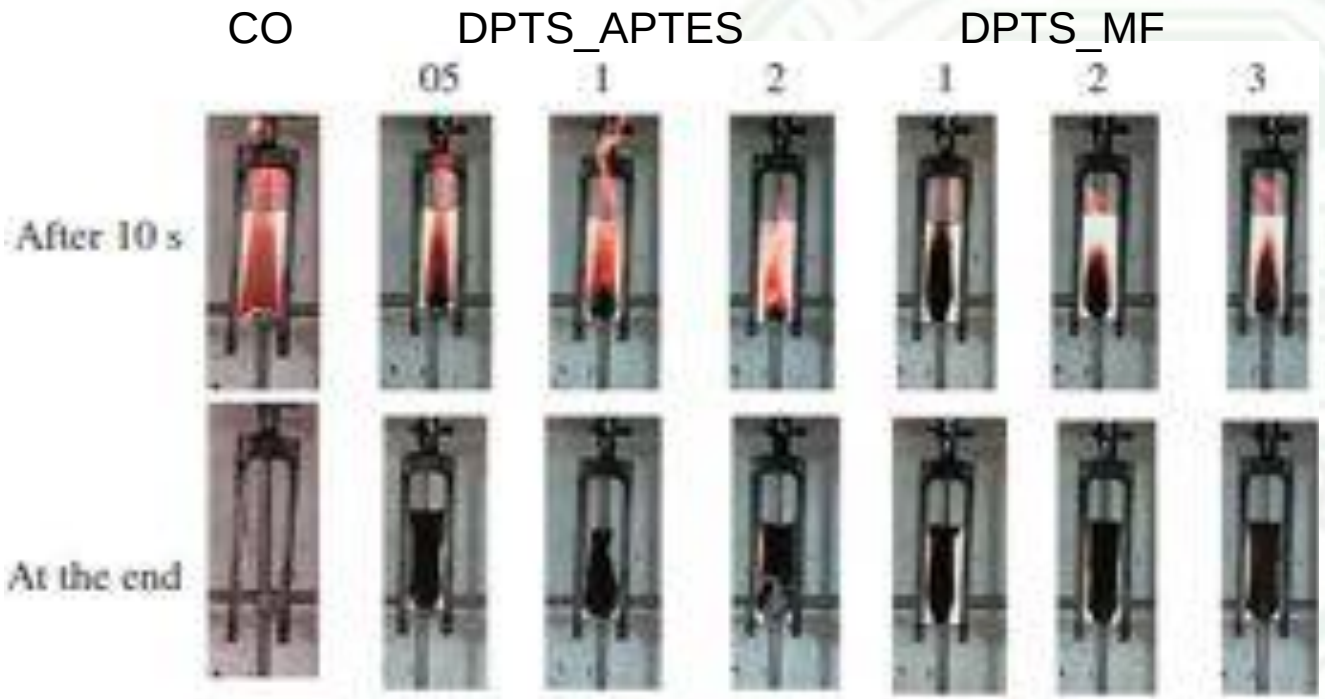


Residue of untreated and treated cotton fabrics at the end of the flammability test.

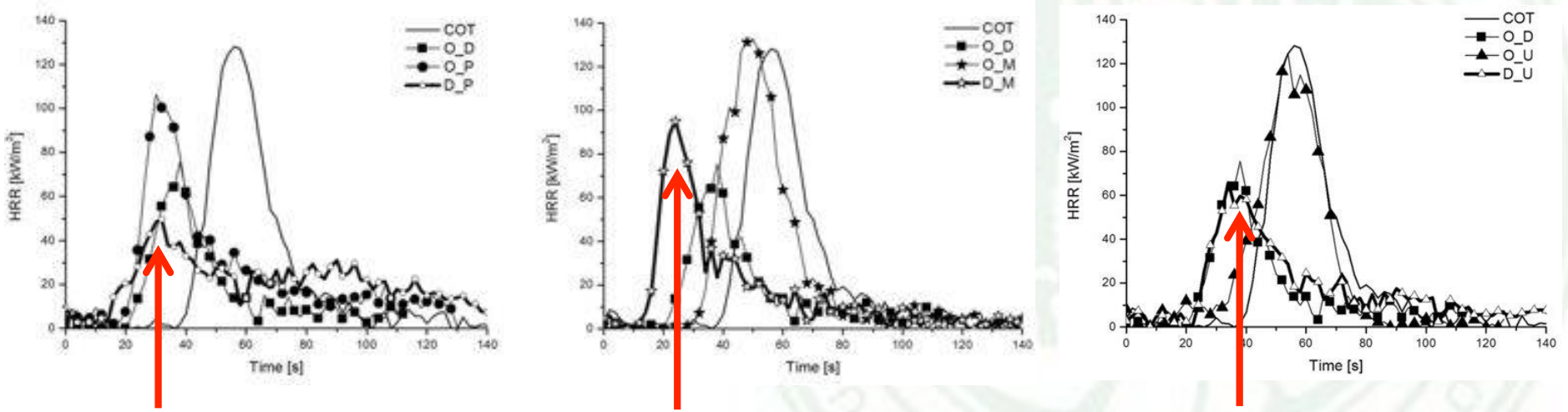
Films containing either APTES or MF are able to:

- reduce the cotton total burning time and rate;
- generate high residues at the end of the test in comparison with pure cotton.

PRESENTAZIONE PL-14

Rosace: Synthesis and characterization of hybrid phosphorus-silica films for halogen-free flame retardant cotton fabrics

Cone calorimetry



TTI is strongly reduced for all the formulations

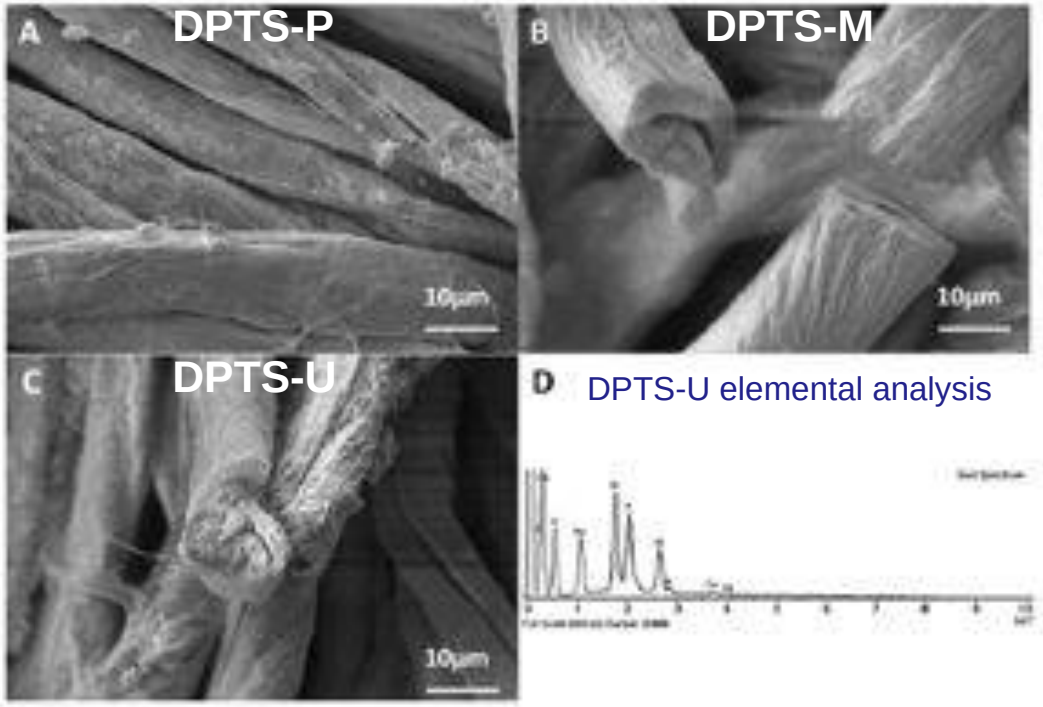
Referring to D_P sample, HRR is much lower than those of pure cotton, O_D and O_P.

J. Alongi, C. Colleoni, G. Rosace, G. Malucelli, *Polymer Degradation and Stability* 98 (2013) 579-589.

PRESENTAZIONE PL-14

Rosace: Synthesis and characterization of hybrid phosphorus-silica films for halogen-free flame retardant cotton fabrics

Residue SEM images of the residues left by D_P (A), D_M (B) and D_U (C).



It is noteworthy that the fibres are still compact in their structures and well covered by the coating.

J. Alongi, C. Colleoni, G. Rosace, G. Malucelli, *Polymer Degradation and Stability* 98 (2013) 579-589.

PRESENTAZIONE O-06

De Clerck: Halochromic textile materials as innovative pH-sensors

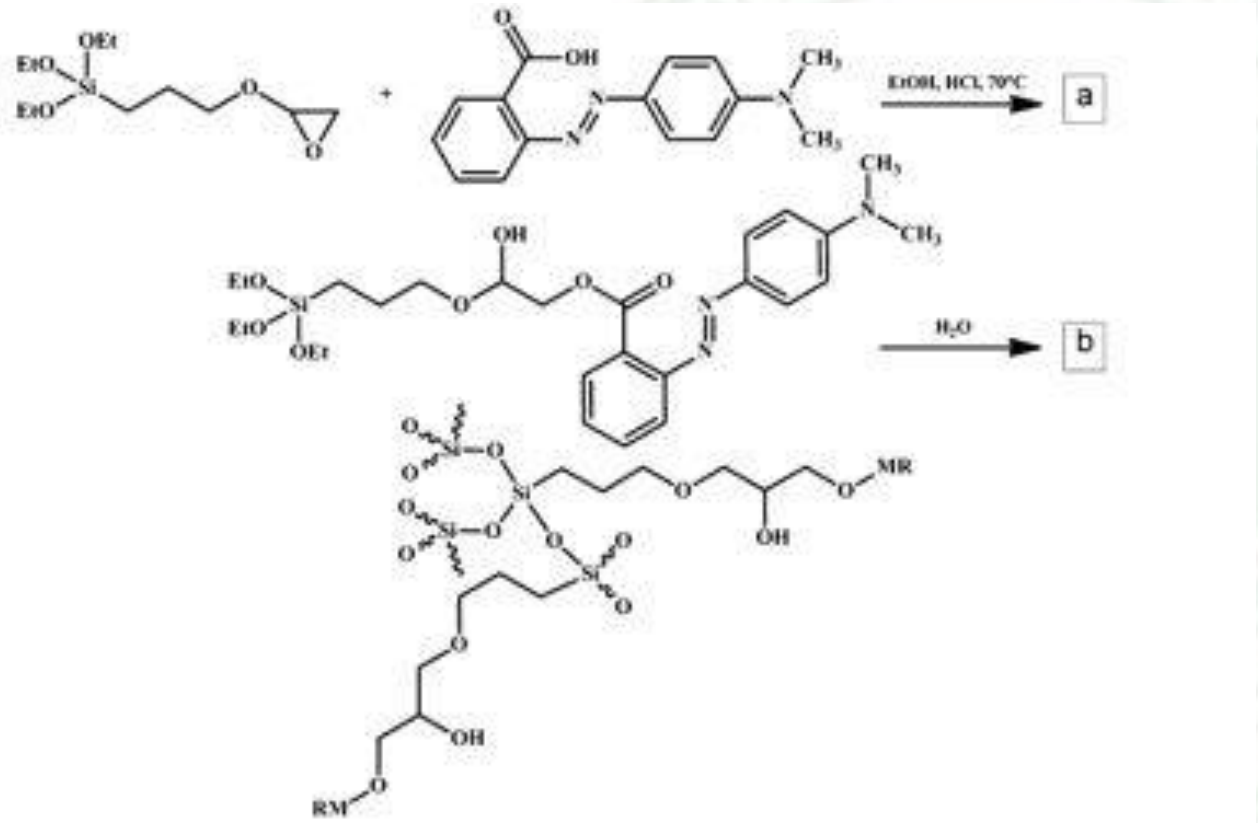


Fig. 1. Mechanism of sol–gel reaction: reaction between GPTMS and MR (a), hydrolysis and condensation leading to the hybrid sol–gel (b).

PRESENTAZIONE O-06

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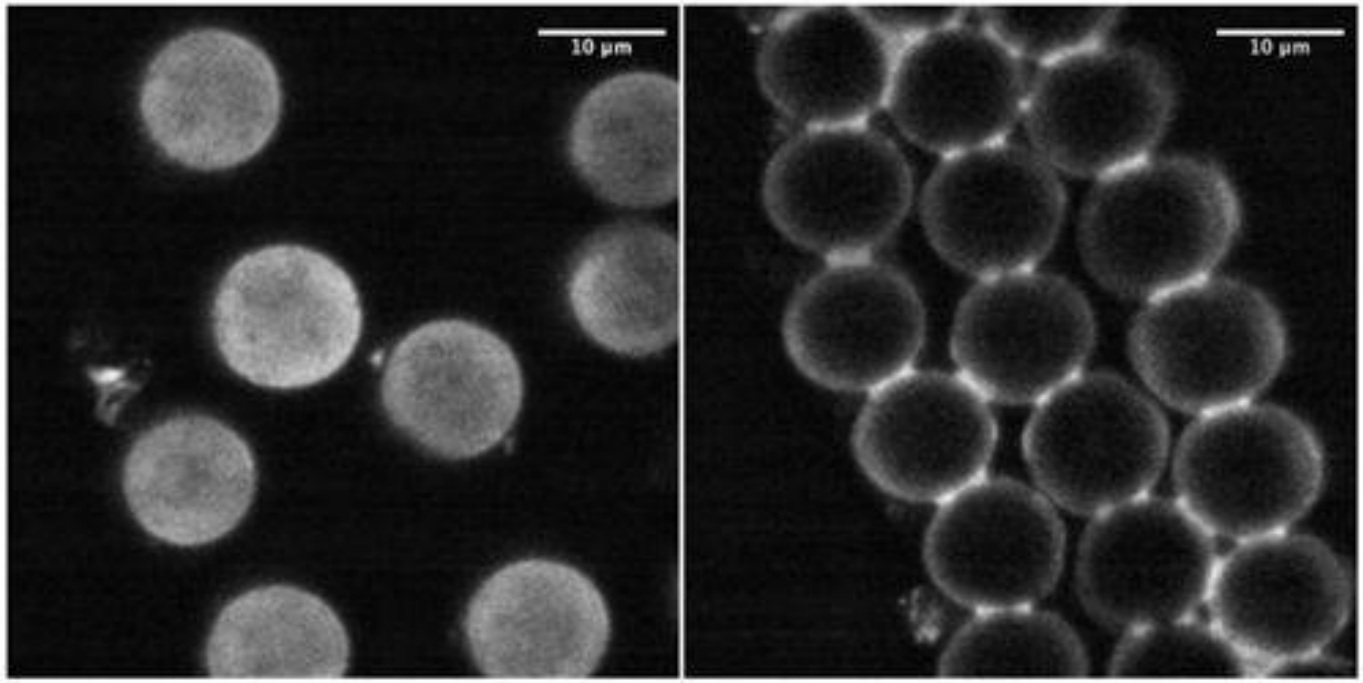

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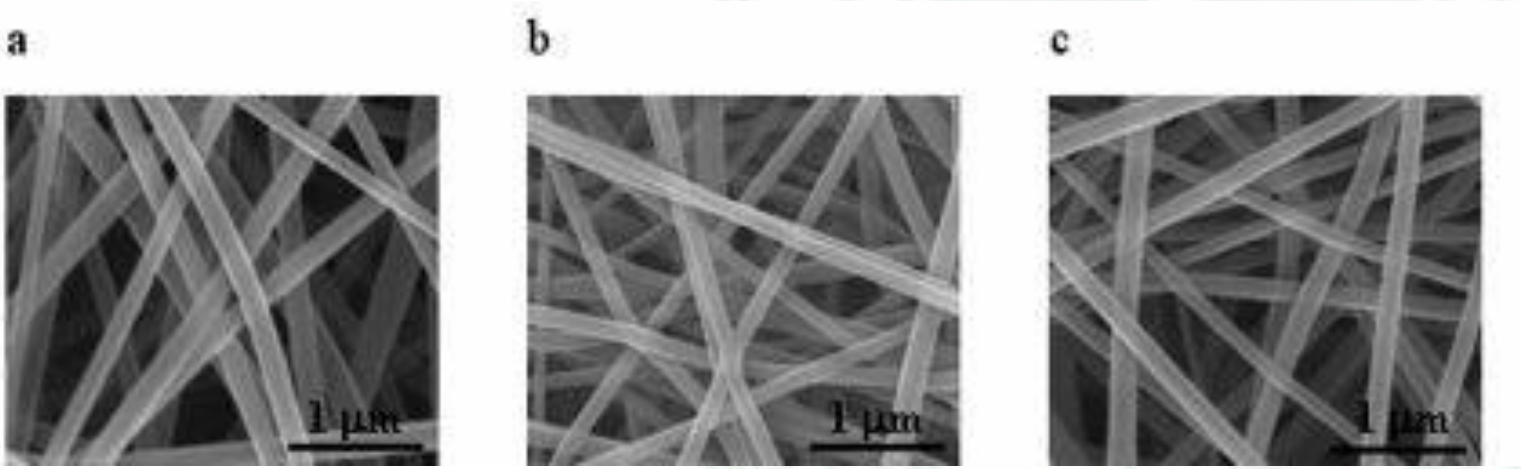


SEM images of PA 6.6 nanofibres : reference sample (a), with 0.32%omf Bromocresol Purple (b), with 0.32%omf Brillinat Yellow ©

PRESENTAZIONE O-09

Sampaio: Nanopigments of silica on the dyeing of wool fibres

The advantages of the nanopigments over the anionic dyes used on wool are as follows:

- the use of environmentally dangerous metal-complexes is eliminated;
- the use of environmentally dangerous ammonia is eliminated;
- the fibre damage is eliminated;
- high wet fastness is achieved.

Figure 3. Micrograph of cross section of red nanopigment wool dyed sample

Wool fibres were successfully dyed with nanopigments of silica in a medium/dark colour. Nanopigments of silica diffused into the wool fibres, so a ring dyeing did not take place, and thus resulted in good washfastness results. The dyeing process with nanopigments is a one stage process, simple to apply and presenting no toxicological issues.

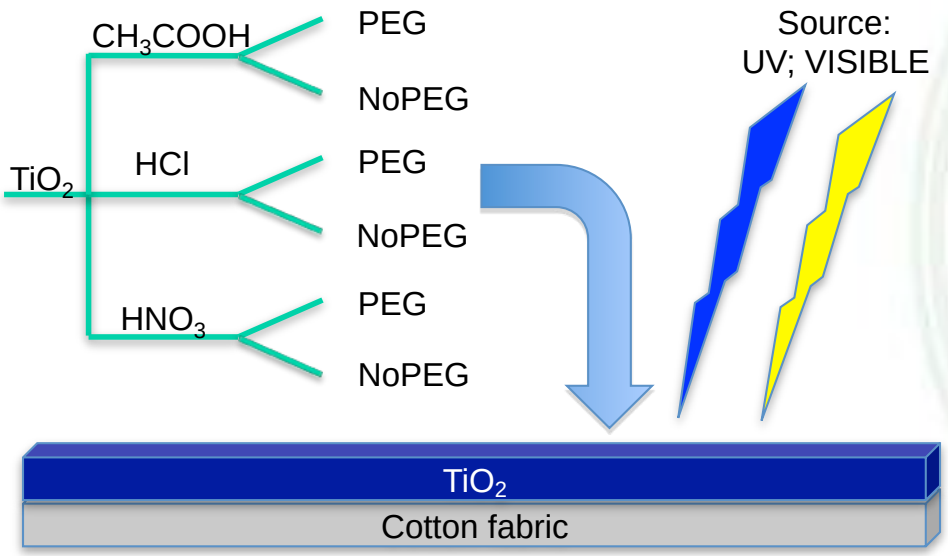
PRESENTAZIONE O-20

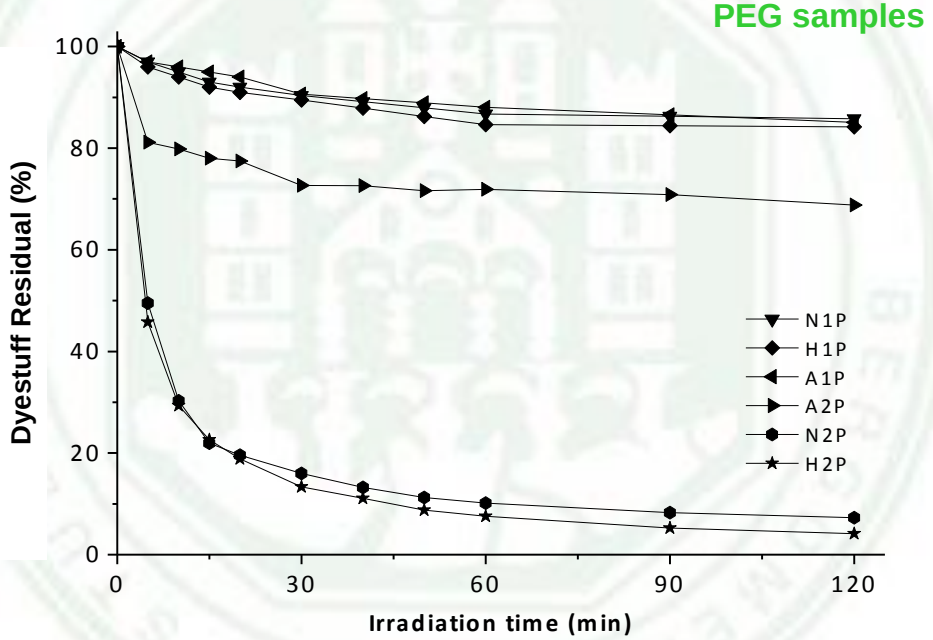
Alongi: Sol-gel treatments for enhancing flame retardancy of cotton: state of art and perspectives

Very recently, the exploitation of oxidic networks derived from sol-gel processes for the surface modification of natural and/or synthetic fibres/fabrics has been successfully assessed, giving rise to novel “green” flame retardant systems. Indeed, inorganic, doped and hybrid organic-inorganic architectures can significantly improve the thermal stability and flame retardancy of the treated textile substrates. The present paper aims to describe the state of the art, the current academic efforts and the perspectives on the use of sol-gel derived hybrid architectures as effective flame retardant systems [1, 2].

PRESENTAZIONE O-37

Colleoni: Low temperature synthesis of titania film for sol-gel applications





PRESENTAZIONE O-37

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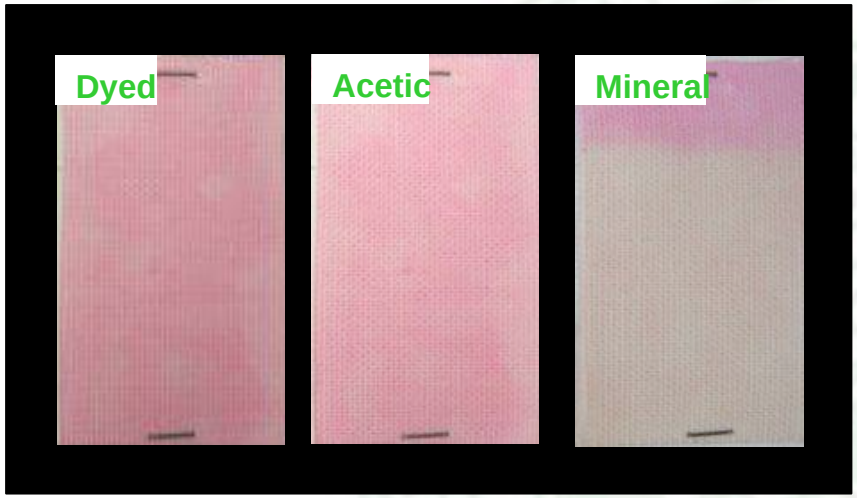


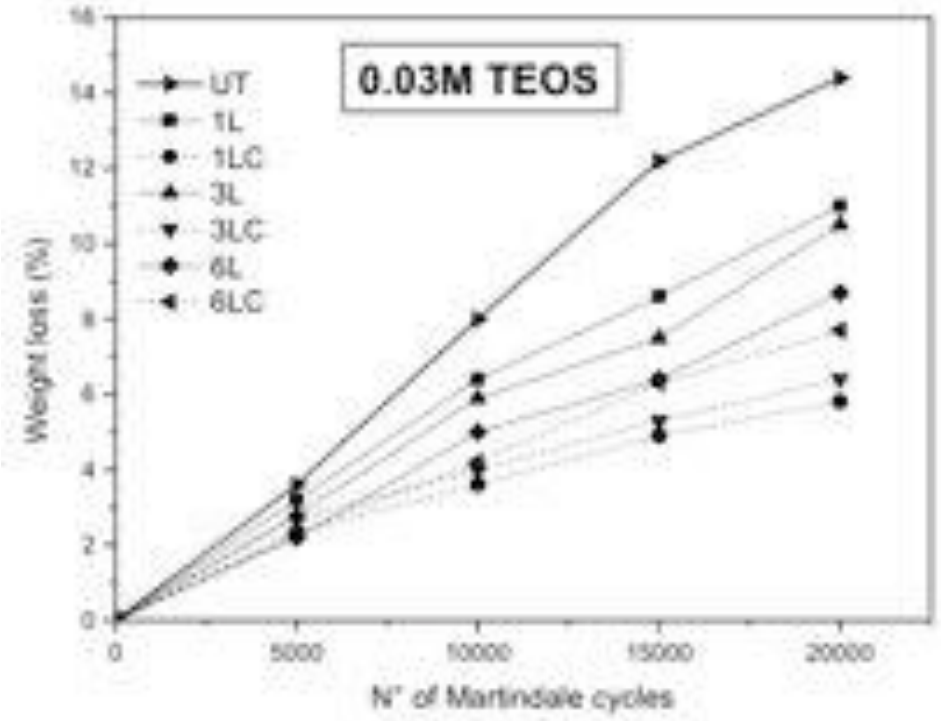
Twelve different titania sols were prepared and applied on cotton fabrics.

The XRD and Tauc plot analysis don't show crystalline structures of the films.

The optical analysis performed by Tauc plot model shows an energy gap in a range of 3.3 eV to 3.5 eV which is higher than the anatase and rutile phases (3.2 eV and 3.0 eV, respectively). Nevertheless, very interesting self-cleaning properties have been observed for the samples prepared with mineral acid both after exposition under UV and visible light.

PRESENTAZIONE O-38

Migani: Effects of a multi-step sol-gel process of inorganic silica coatings on cotton fabrics



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PRESENTAZIONE O-38

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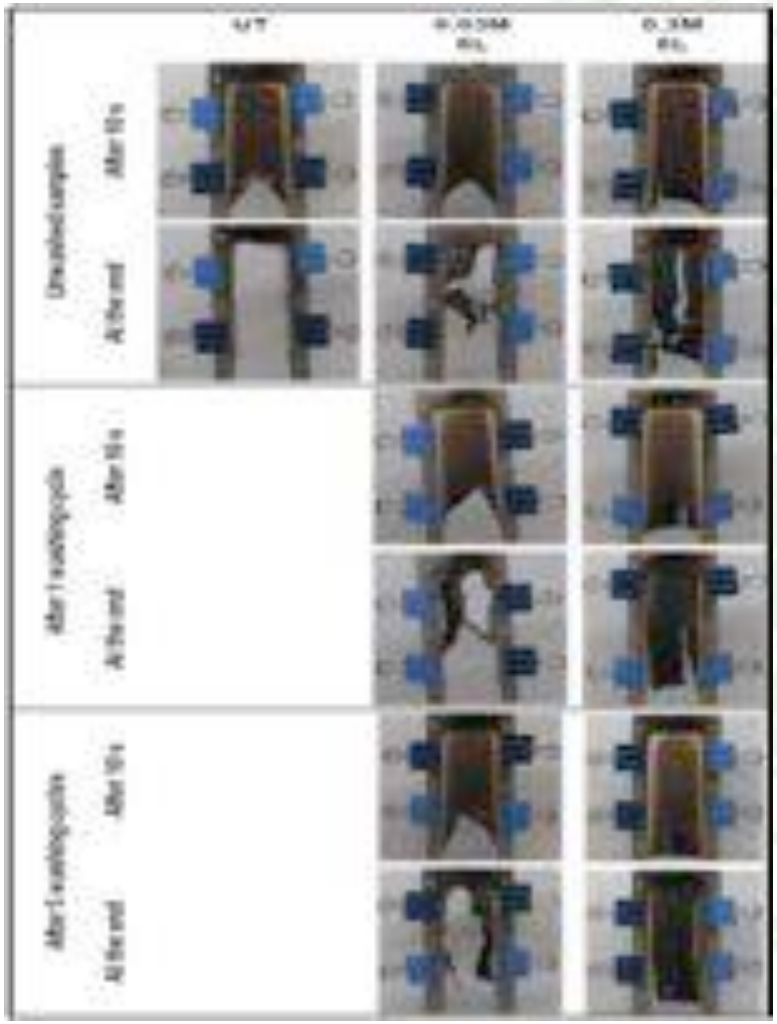
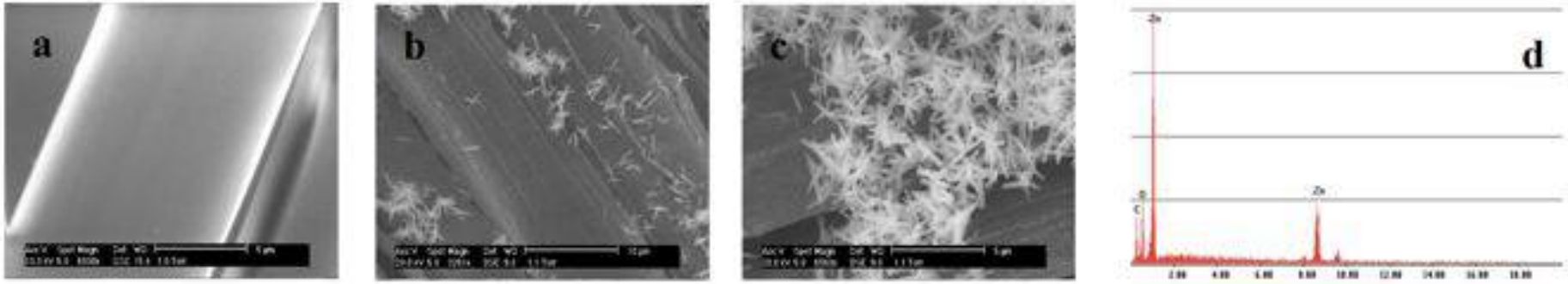


PRESENTAZIONE P-09

Colonna: Growing of zinc oxide nanoparticles on silk fabric



Escherichia coli ATCC 10536				
Sample	**UFC/ml T_0**	**UFC/ml T_{24} (24h)**	**Bactericidal activity (%)**	**Bacteriostatic activity (%)**
Internal ref. Cotton	$8.8 \cdot 10^5$	$1.5 \cdot 10^8$	-	-
Silk	$8.8 \cdot 10^5$	$1.5 \cdot 10^8$	0	0
Coated Silk	$8.8 \cdot 10^5$	0	100	100

PRESENTAZIONE P-09

Colonna: Growing of zinc oxide nanoparticles on silk fabric

The coated silk shows a considerable delay in flame propagation.

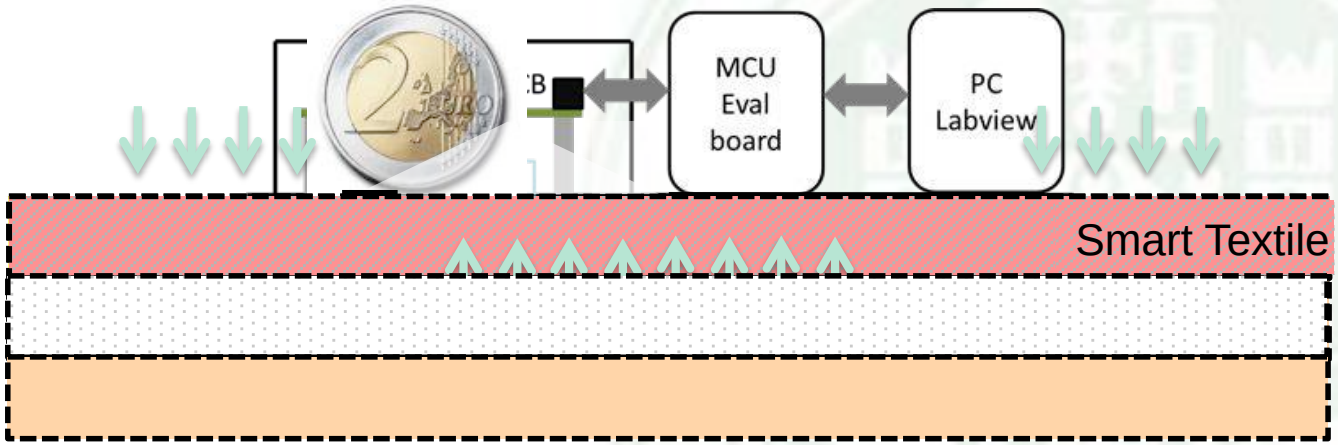
Finally, the photocatalytic activity of the ZnONPs coated silk was studied, testing the photoactivated degradation of formaldehyde (HCHO).
The result show interesting photocatalytic properties.

A new functional textile, through a ZnONPs coating of silk fabric, was prepared.
This kind of coating shows excellent effects of flame retardancy, antibacterial and photocatalitic activity, worthy of note at lower cost and with colorless effect.

PRESENTAZIONE P-18

Guido: Textile-based wearable sensor for sweat pH monitoring

System set-up



PRESENTAZIONE P-18

Guido: Textile-based wearable sensor for sweat pH monitoring

Smart and interactive textiles are an interdisciplinary field that brings together specialists in information technology, micro systems, materials and textiles.
The focus of this research is on developing the enabling technologies and the manufacturing techniques for the production of flexible, conformable textile based information system that are expected to have unique applications for different end uses.

In the future, based on the above principle, different organic sensors immobilized onto textile fabric by inorganic matrix could be used to develop a portable device with a warning function and used to monitor at the same time a range of parameters such as environmental or physiological.
The advantage of the electronics presented in this paper is that it can be easily adapted, eventually changing only the photodiode and the engineering conversion in the firmware, to any visible color change.

ULTERIORI PRESENTAZIONI

PRESENTAZIONE PL-08

Employing ionic liquids for preparation of PET fibres with cotton-like surfaces

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The resulting fibres exhibit highly hydrophilic surfaces as known from cotton while the strength of the polyester fibre is not affected. Furthermore, the modified PET fibres are suitable for a reactive dyeing with dyestuffs typically used for the colouring of cotton. In addition, they yield excellent adhesion values when used for preparation of composites.

The PET fibre with a “cotton-surface” is of interest not only for apparel, since it promises the “cotton feeling” but also on technical textiles, since it exhibits a functional or reactive surface.

Grazie per l'attenzione