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# Textiles in Building and Living

context

1st CONFERENCE

*Enrico Venturini*

Barcelona

31st January 2019

Cost Action
CA17107

# Textiles in Building and Living

## “Textiles instead of concrete" not only a slogan, a fact”*











context

*Textile World Jürg Rupp, Executive Editor Geotextiles: The Concrete Alternative January/February 2011

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# Textiles in Building and Living

## Buildtech

- Textile for building: acoustic & thermal insulation
- Textile for building: protection against sun, wind, fire, water.
- Textile concrete: protection against UV & electromagnetic radiations
- Textile integrated LED & other electroluminescent material: energy saving & use of more sunlight
- Textile reinforced concrete (TRC) composite material: similar to steel reinforced concrete, giving lightweight structures with high durability

## Materials

- Glass
- Aramide fibers
- Carbon fibers
- Crosslink with resins
- Natural fibers
- Synthetic fibers

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*Textile World Jürg Rupp, Executive Editor Geotextiles: The Concrete Alternative January/February 2011

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# The state of the art

Semi-rigid fibre-based insulators (rock wool). *Issue: Health protection*


Polyurethane and Expanded Polystyrene

Semi-rigid synthetic and natural low-density insulators (). *Issue: non-overlapping, flammability*

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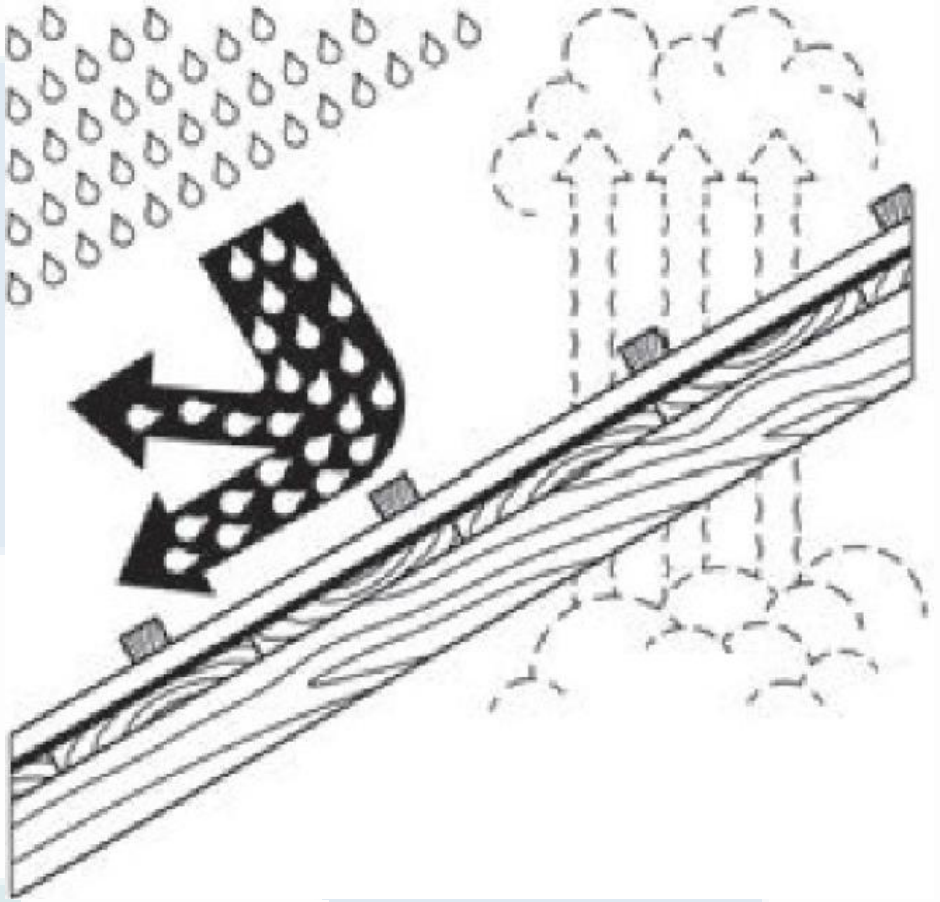
# The state of the art

Barrier Textile Layers (Bituminous membranes). *Issue: water stagnation and perforation risk for roofs*




Highly flexible mixed multi-layer insulators (polyestere +aluminium films, fibres, thin foams) – from aerospace sector

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# Tomorrow's building: the new paradigma

context

# Why new materials

- Novel functionalities
- Meet customers needs
- Extreme customisation
- Novel applications

New properties, manipulation until the atomic scale, for structural and diversified functions

STANDARD PROPERTIES:

- Tenacity, durability, thermal and acoustic insulation and aestetichs

ADDITIONAL PROPERTIES:

- Dirt-repellent, self cleaning
- Bacteria-killer, mildew-proof
- Air/water depuration, solvents degradation
- Antistatic
- Shielding (UV rays, Radiofrequency sunlight, etc.)

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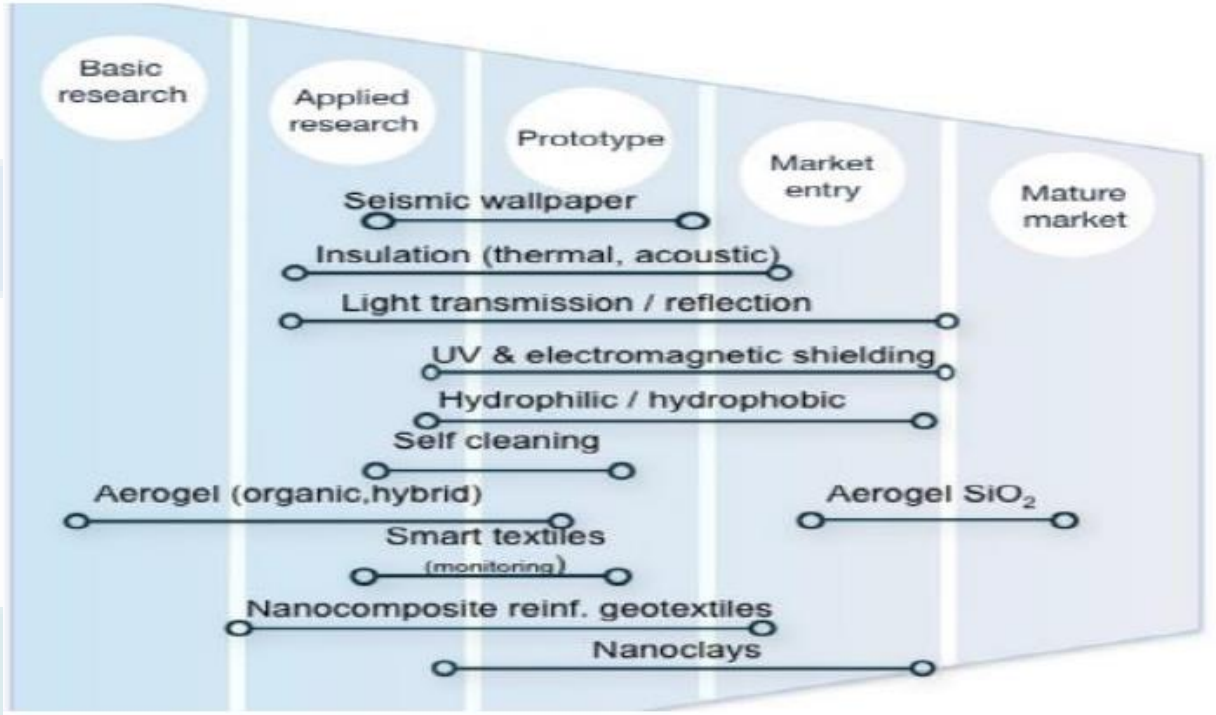
# Nano-materials in building




Nanotechnology for textile membranes:

- acoustic and thermal insulation
- efficient energy management
- controlled light transmission
- easy cleaning and decontamination behavior

Renovation

- self-healing concrete
- localized crack repair
- reinforcement of critical walls
- wrapping of existing columns
- protection against earthquake or hurricanes
- explosive incidents and protection purposes

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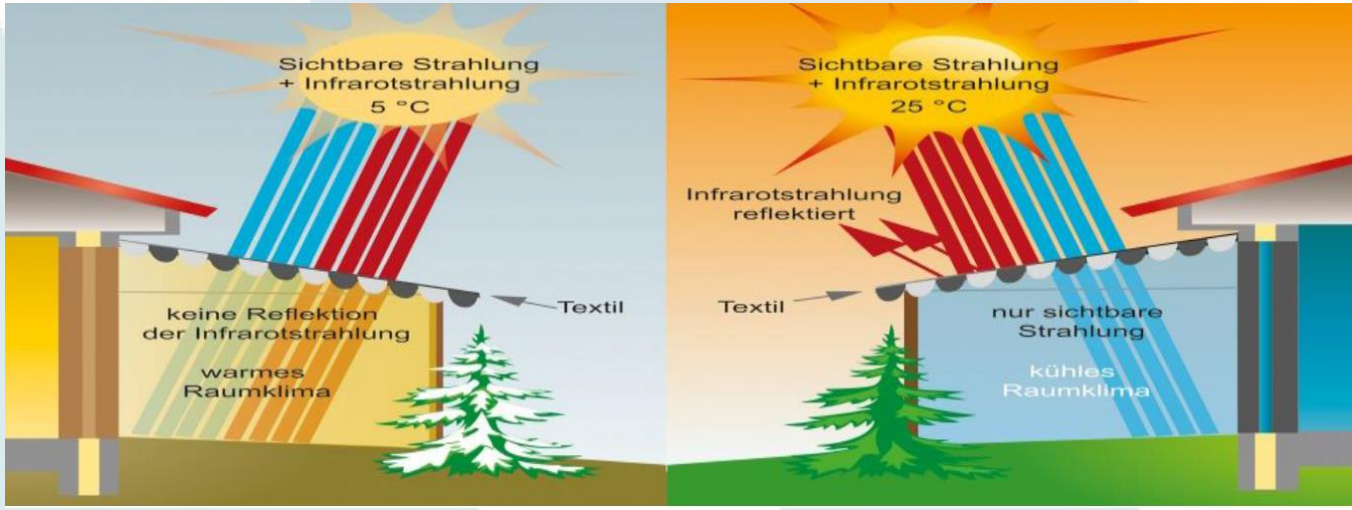
# New textile materials: solar – acoustic protection

External and internal blinds: fabric adaptation according to thermal permeability to reduce cost of heating or air conditioning




Coated glass fibers woven with a special weave and a controlled diameter: intensity of acoustic absorption and thermal regulation

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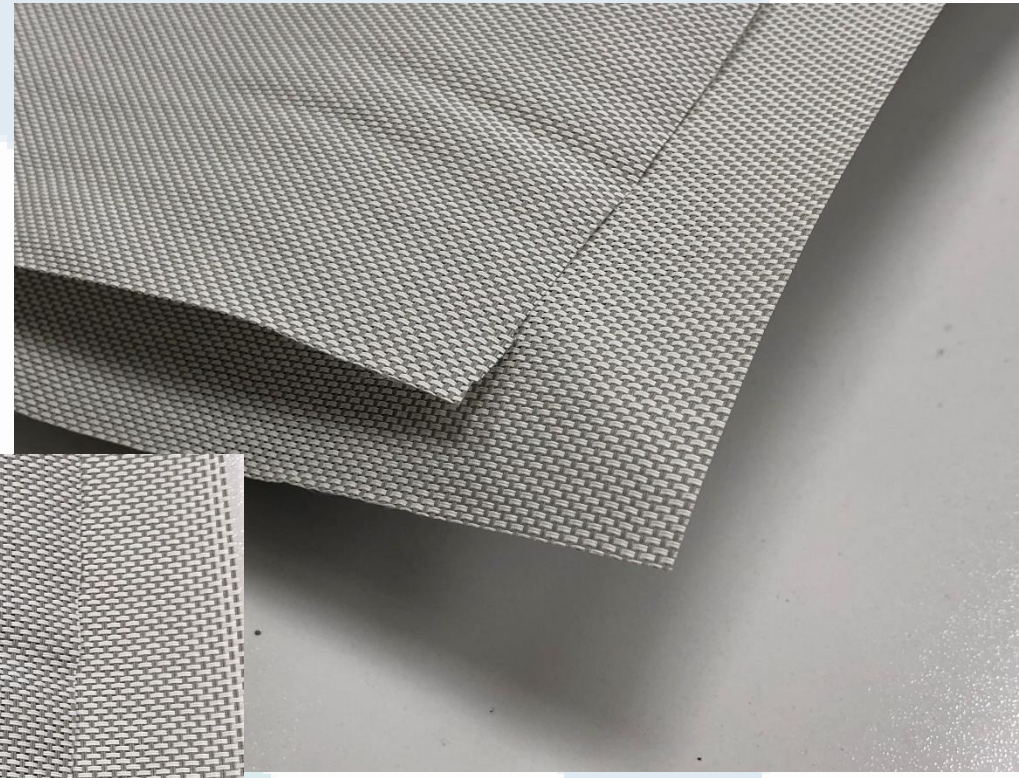
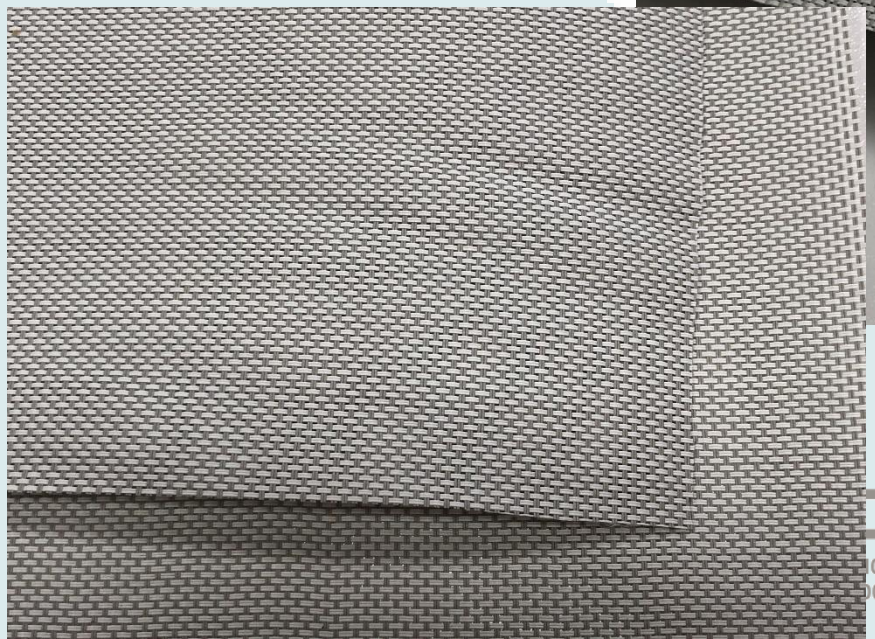
# New textile materials: solar filtration

PVC Coated glass fibers woven with a special weave and a controlled diameter: intensity of acoustic absorption and thermal regulation





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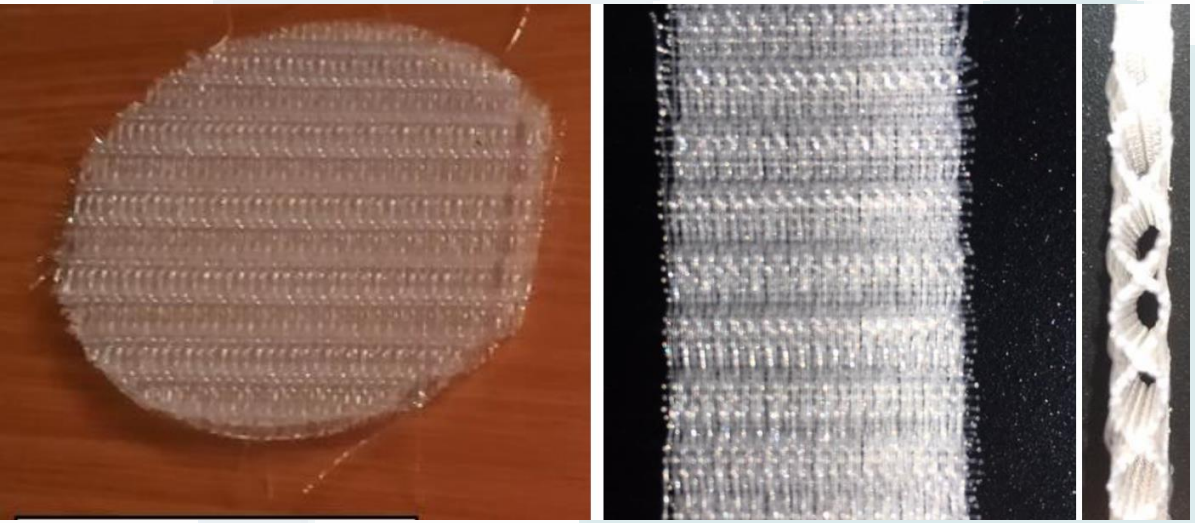
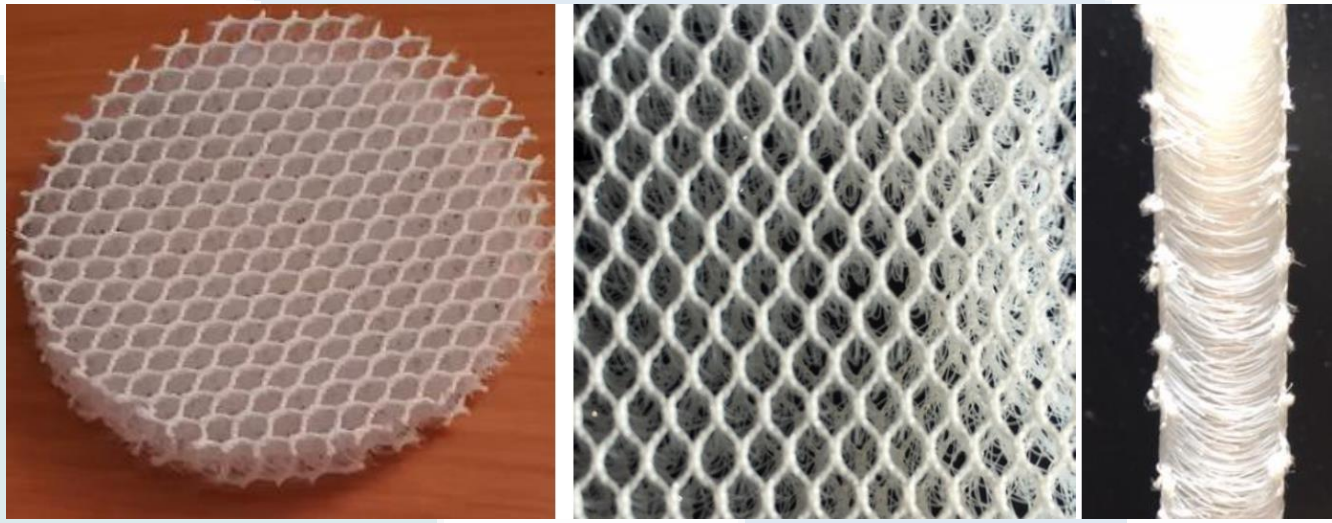
# New textile materials for building



Ventilation ducts parallel to the weft, semi-rigid



Drapable, flexiblle and ventilated (internal air blow)

3D textiles for inner tube creation for thermal insulation and heat dispersion

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## New textile materials for building

AEGIS - LENZI EGISTO

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# New materials

- Nanoparticles: $TiO_2$, Au, Ag, $BaTiO_3$, $ZiO_2$
- Chemicals, monomers, Nano-polymers

SURFACES MODIFICATION

- Atmospheric and vacuum plasma
- Polymeric compounds reticulation by:
  - Electron Beam
  - UV
  - microwaves, RF
  - ultrasounds
- Combination of nanomaterials, gas, polimers



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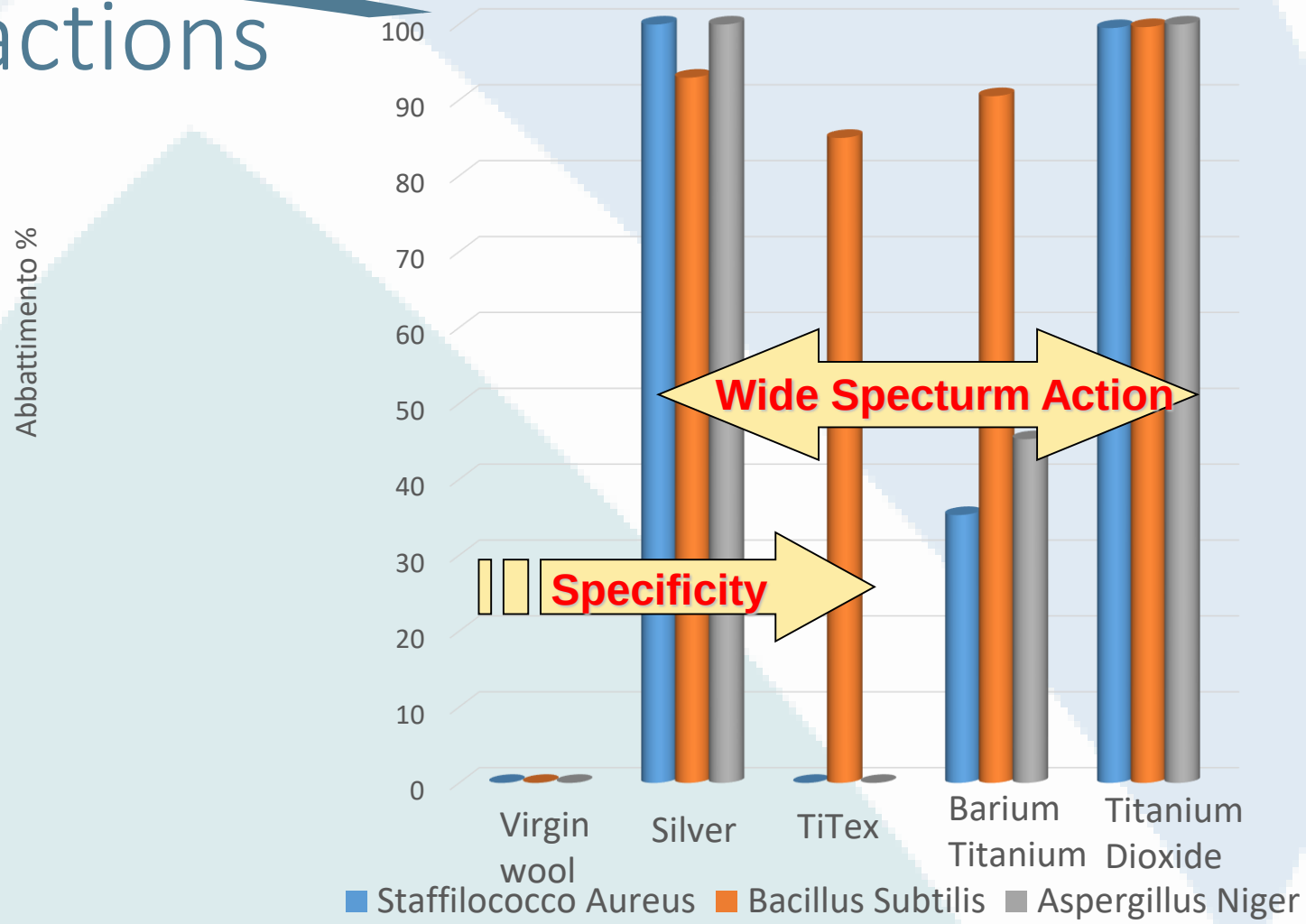
# Bacteria killing actions

## Nanoparticles efficiency

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# Textiles in Building and Living

## Functionalised textile materials

Dirt-repellent, self cleaning

Bacteria-killer, mildew-proof

Healthcare

Public place

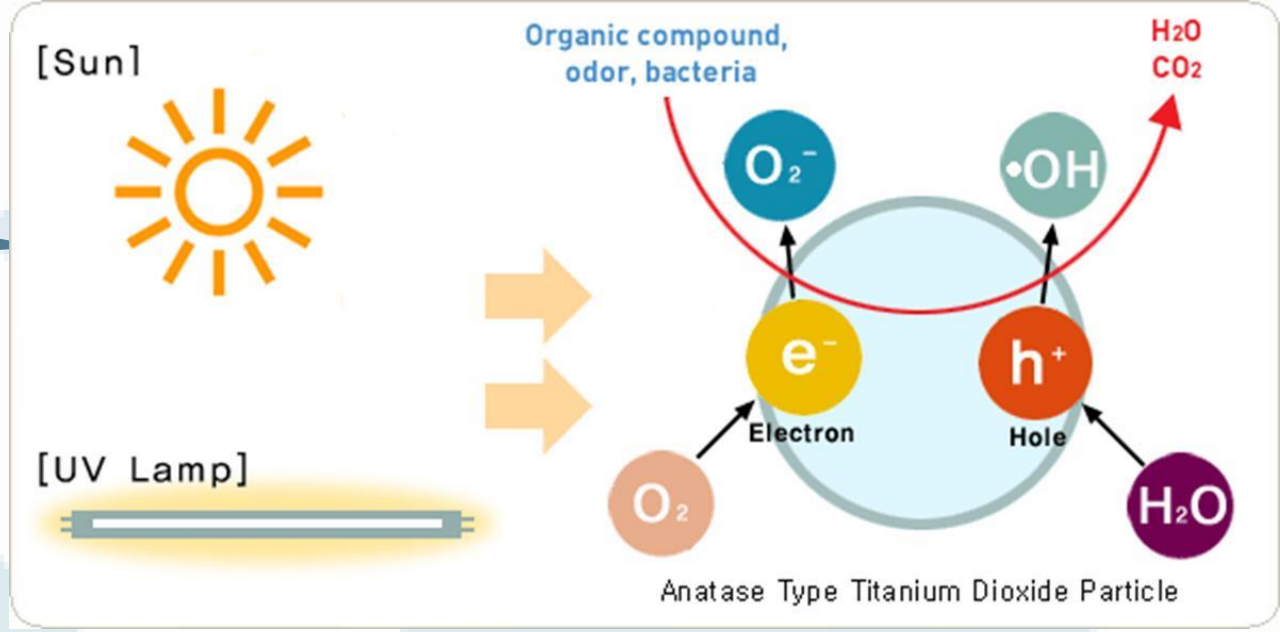
Food

context

sunox®

Living the future.

# Photocatalytic action




## Polluting gases

- **$NO_x$** (Oxide Nitrogen dioxide)
- **$SO_x$** (Sulphur dioxide and trioxide)
- **CO** (Carbon Monoxide)
- **$C_6H_6$** (Benzene)

$TiO_2$

## Transformation action

NO3 - (Nitrate ions)

SO43 - (Sulphate ions)

CO2 (Carbon dioxide)

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# Synthetic grass

Pollution eating and bacteria killing properties

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# Photocatalytic action: the anti-mosquito nets

https://www.youtube.com/watch?v=xyl0oURP6qQ

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# Basalt fabrics

Basalt textile

Pollution eater textile in basalt

BASALT FIBRE COMPOSITES

- PPE (personal protective equipment): fireproof fabrics and fire protection systems
- Textile structures for composite materials
- Thermal screens, barriers to incendiary jets
- Composites for sound and thermal insulation
- Textiles for filtration
- Textile structures for soil reinforcement

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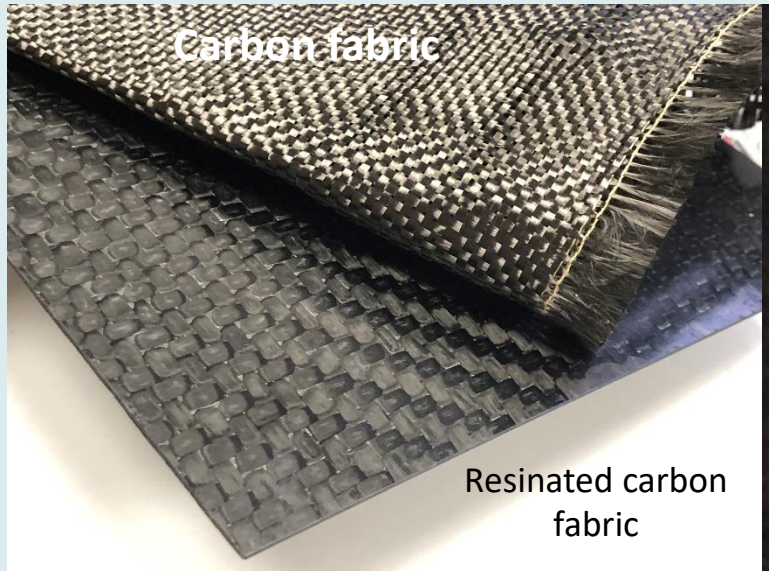
# Carbon fabrics

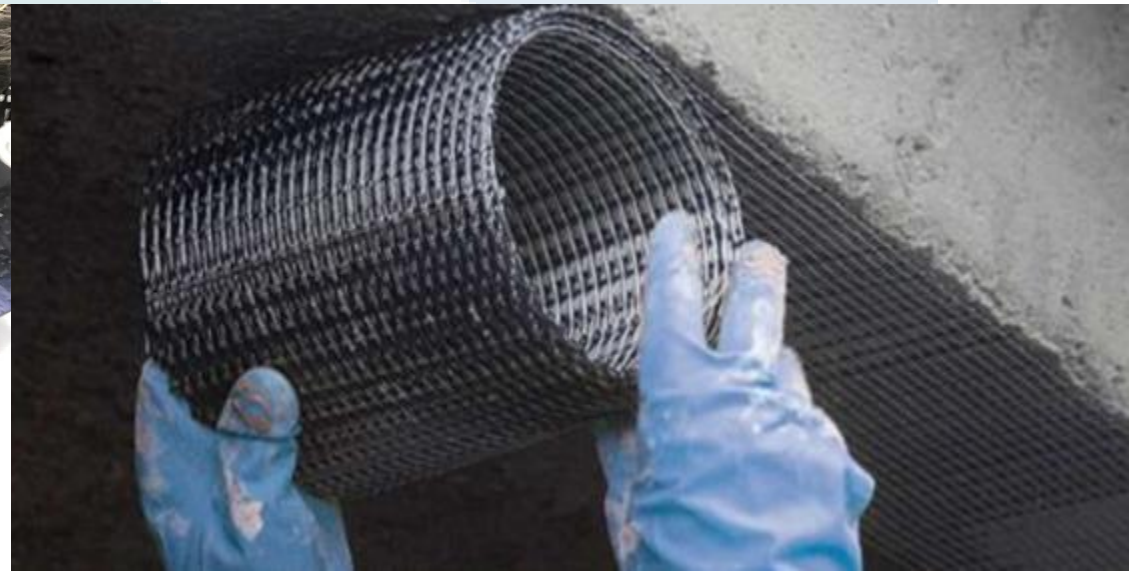
Carbon fabrics reinforcement

- Light weight, 2/3 lighter than steel
- High stiffness, 2 times stiffer than steel
- High tenacity, 5 times stronger than steel
- Textile structures for composite materials

Earthquake resistant carbon fabrics/nets to reinforce structures and concretes




Resinated carbon fabric



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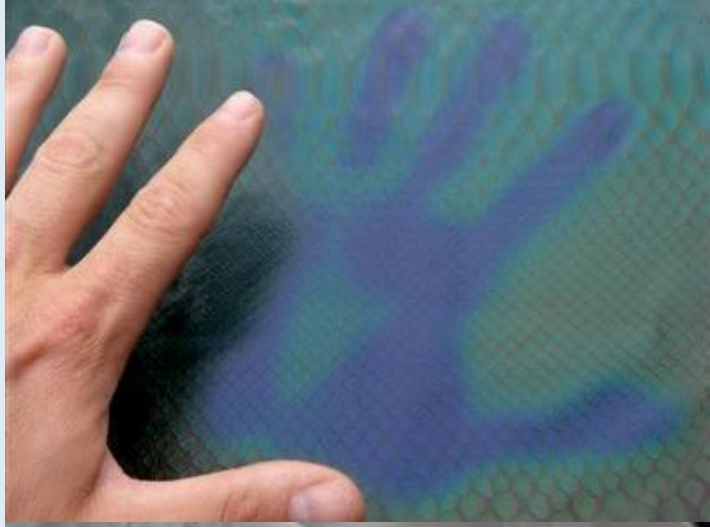
# Photochromic/thermochromic fabrics

Fabrics dyed with specific pigments: colour variation according to the intensity of the light or the heat to which they are exposed.



# Heat shielding fabrics

Textile heat shielding surfaces in 3D: creation of reflective barriers that break down the radiated heat.

# Heating fabrics

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# Optical fibres

Woven fabrics of fine yarns (silk, wool, linen, and optical fibres)


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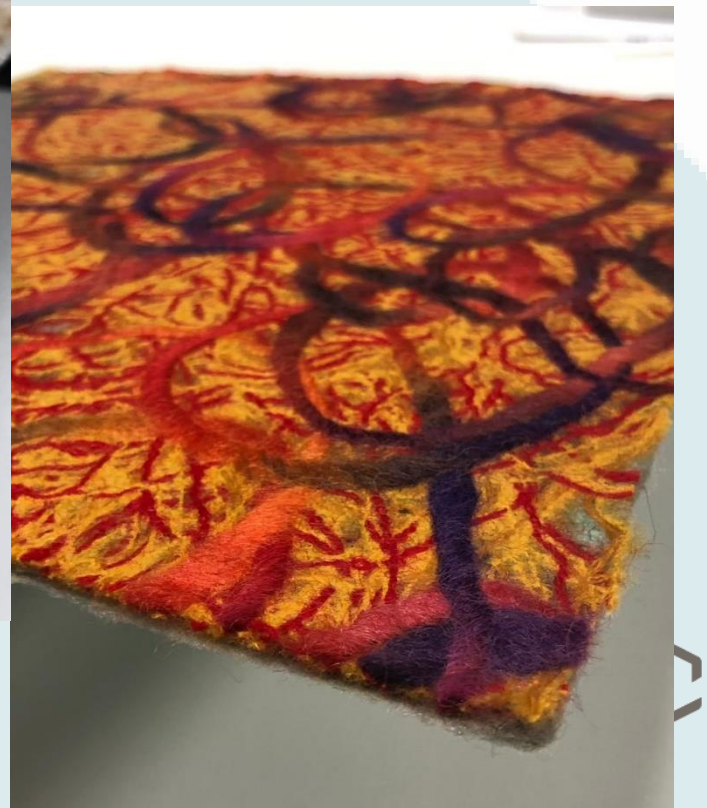
## Multi-function composites

100% fibres material for furniture, covering and panelling



Photocatalytic material

Wood laminated material with dirt-repellency and abrasion resistance

Fibre/cement insulating and fire-proof panel

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Thanks for your attention!

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