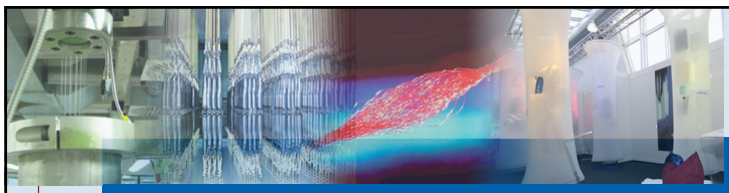

New developments with fiber-based materials

Thomas Stegmaier, Volkmar von Arnim, Martin Dauner, Christoph Riethmüller, Hansjürgen Horter, Heinrich Planck

Institut für Textil- und Verfahrenstechnik Denkendorf

Automotive interiors EXPO 2012
Messe Stuttgart, 12-14 June 2012

German Institutes for Textile and Fiber Research Denkendorf

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Content

- Heating with flexible fibers
- Nanofibers for cabin air filter
- Selfcleaning textiles
- Lightening textiles
- Smart Textiles
- Testing, reliable lab

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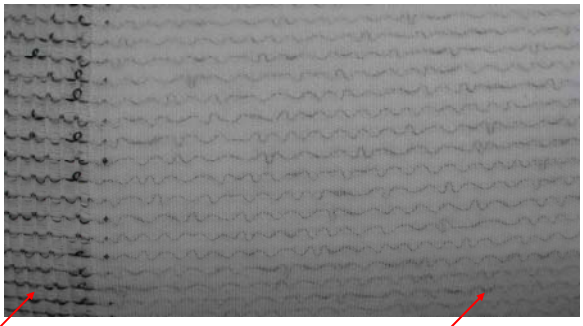
Electrical Heating for Interior: Spacer knittings

- Carbonfilaments as heating device
- Silver coated yarns for power supply



Carbonfilament
for contacting, noninsulated

Carbonfilament
for heating, insulated by PET knitting

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Electrical Heating for Interior: Spacer knittings

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- flexible material
- strechable (formability over edges)
- heating capacity adjustable (length and number of Carbonfilaments)
- electrical insulation already integrated in system
- thermal insulation already integrated
- 200-400 W/m² heating power, equal distribution

Spacer knitting PET filaments

Carbonfilament for heating, insulated by PET knitting

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Air cabin filtration: Definition micro and nano fibers

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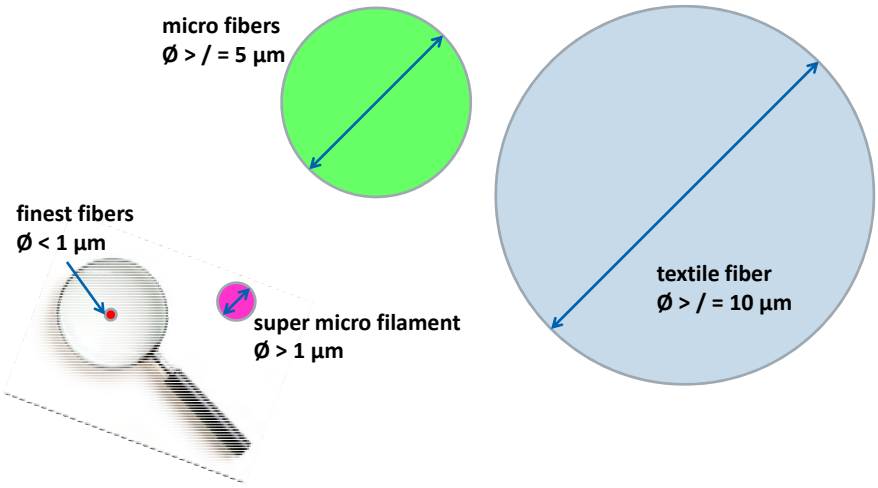

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Finest fiber production at ITV Denkendorf: 500 mm wide meltblow-unit

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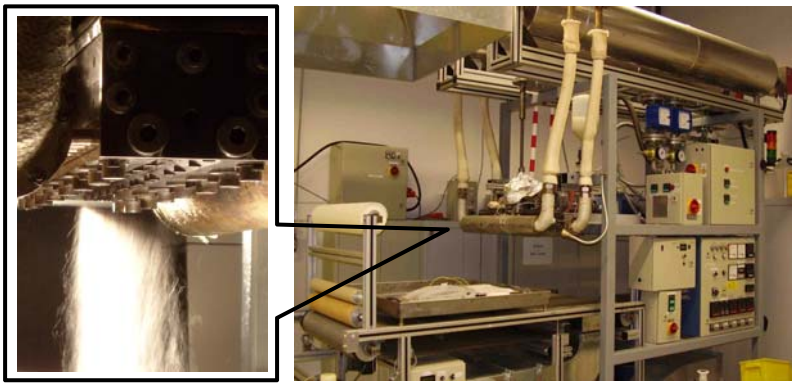

Test unit for production close to industrial processes

© DITF

Finest fiber production at ITV Denkendorf: 1 m wide centrifugal spinning

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Finest fiber production at ITV Denkendorf: bi component spinning

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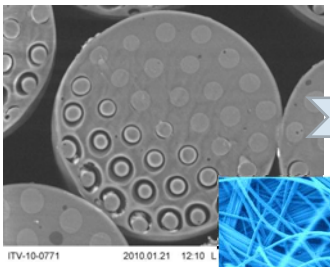
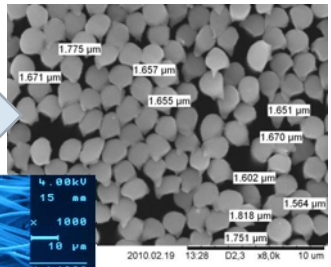
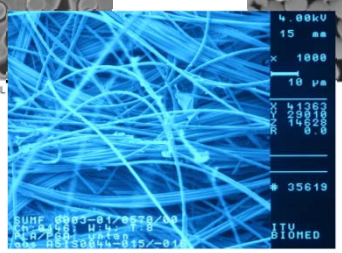


VE-H_2O



Islands-in-the-sea-filamente
PET / sulfonised Polyester



- washing out of island-surrounding matrix
- single filaments from 1 to 2 µm
- nonwovens forming

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Problem: binding of finest fiber nonwovens

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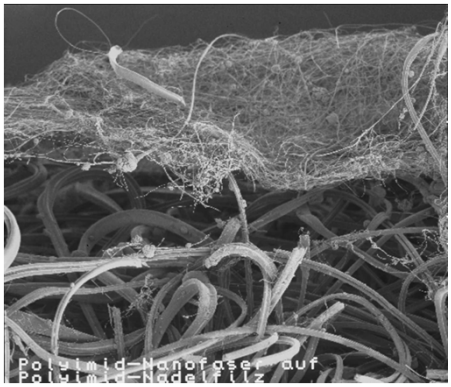

- 1. No connection to support textile
- 2. Low mechanical stability of nonwovens (no connection between fibers)

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Solution: hydroentanglement at ITV Denkendorf

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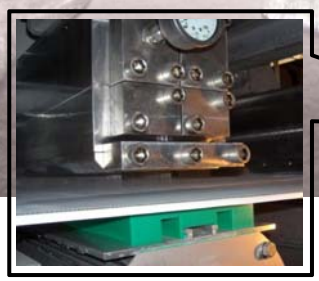
Layout:

- pressure up to 100 bar
- prewetting, twin-beam
- finest jetstrips
- support belt: fine fabric
- max. water consuption 11 m³/h
- 500 mm working width
- inline in meltblow unit



source: Trützschler Nonwovens GmbH

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Meltblow-nonwovens from Polypropylen

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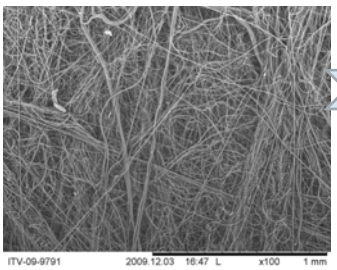
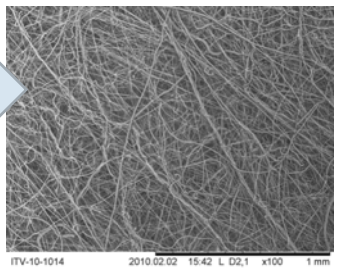


WE



Fiber diameter and air permeability comparable

- no defects
- increased strength
- reduced hairiness

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Dust filtration

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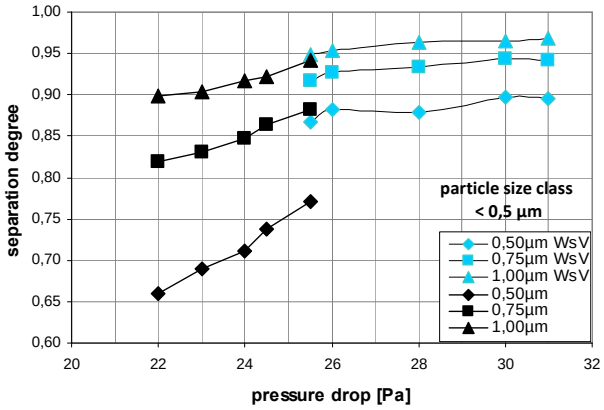
Meltblow-nonwoven 35 g/m², nonentangled versus waterentanglement



water pressure:
30 bar + 50 bar

filter test 60 min
(close to
VDI Methode 3926)

2.5 g Sikron SF 600:

x_{min}	0,3 µm
x_{50}	3,0 µm
x_{max}	10,0 µm

entanglement can increase separation efficiency

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Photocatalytic degradation: Principle

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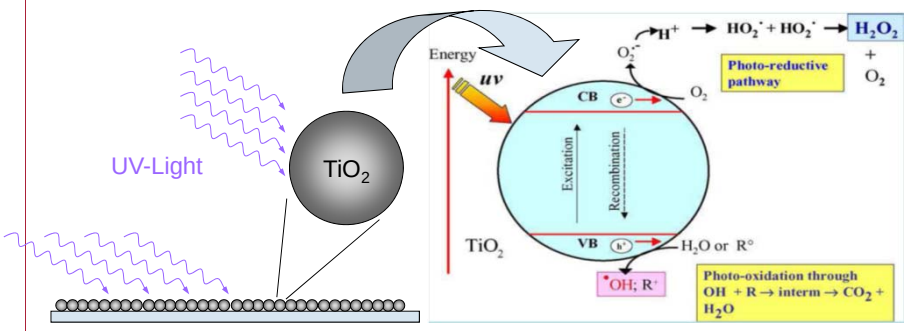

- **Degradation of dirt on surfaces**
- **Degradation of organic contamination in air**

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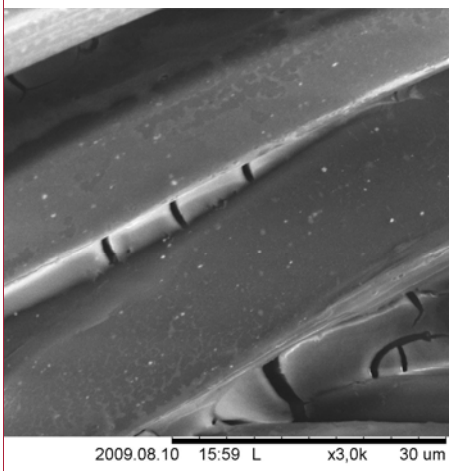
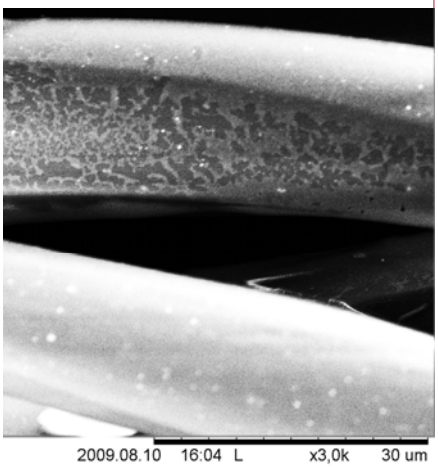
TiO_2-coating on yarns



1,5% dispersion



0,5% dispersion

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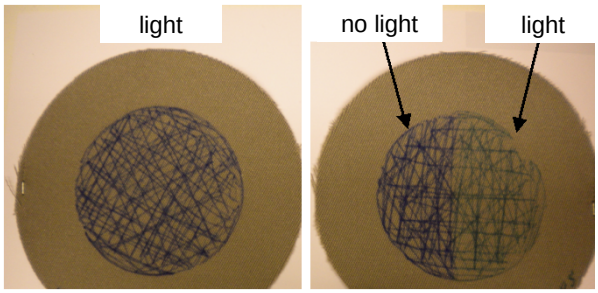
Photocatalytical selfcleaning by nano-Titandioxid – ballpen

Decoloring ballpen



not finished fabric

TiO_2-finished fabric

Light source: 72 h Xenontester

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Photocatalytical selfcleaning by nano-Titandioxid – ballpen

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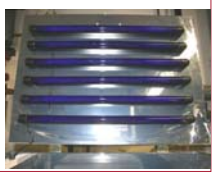
coffee coffee

No light light

16 h UV-Box



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Degradation organic gases in air Formaldehyd & Methanol

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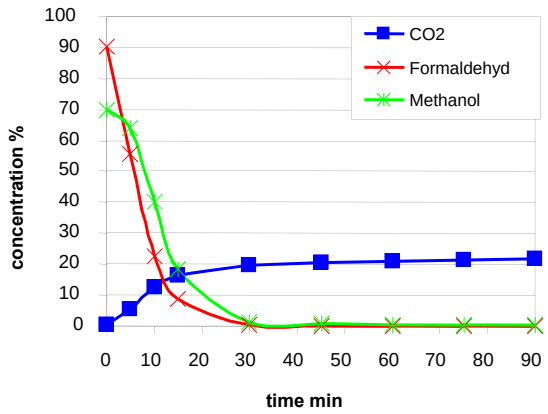
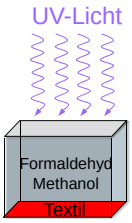


Light source:
Xenon-lamp,
UV: ca. 40 W/m²



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Applications for photocatalytic active textiles

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Lightening textiles
Technology for mobil applications

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Backlighted textiles

Textiles for guiding of light

Self lightening textiles

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Development possibilities
measuring

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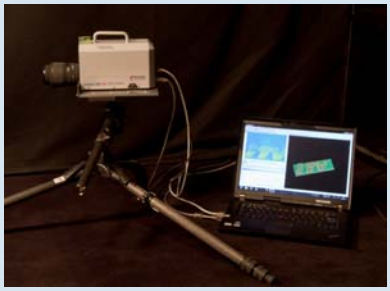
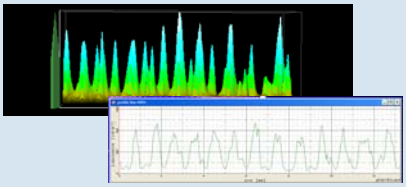
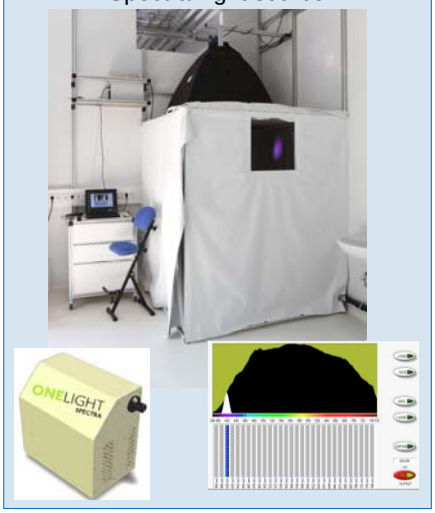
Color and light density camera





Spectral light source



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Backlighted textiles

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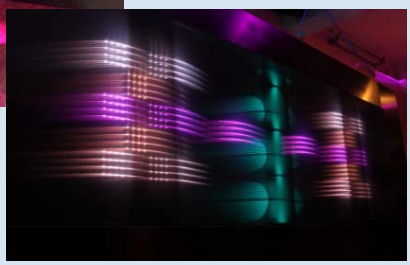

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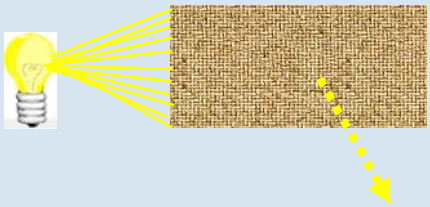
Textiles for guiding of light



✓Use of know light sources
✓Use established technologies

– bad energy efficiency
– mechanical sensitive
– high material costs

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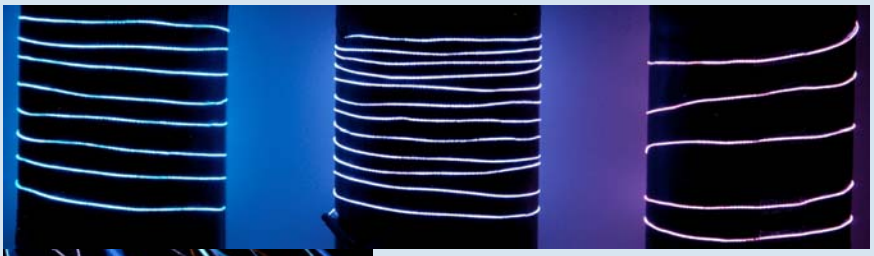
Self lightening textiles



- thickness adjustable (shown yarns: ca. 0,1 mm)
- elongation: adjustable to different yarn materials
- low bending stiffness
- light density > 500 cd/m² possible
- different colors and mix possible
- simple contacting by intelligent concepts
- long life time

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Self lightening textiles

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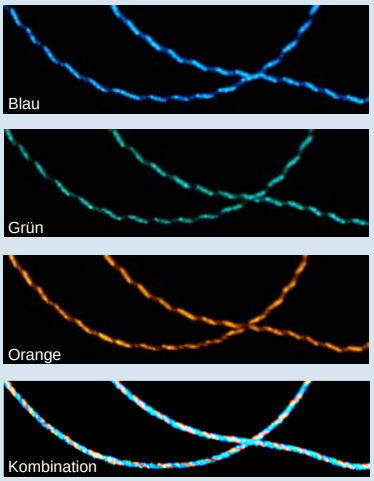

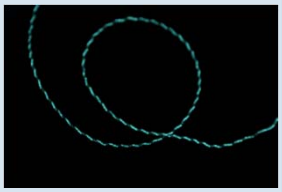

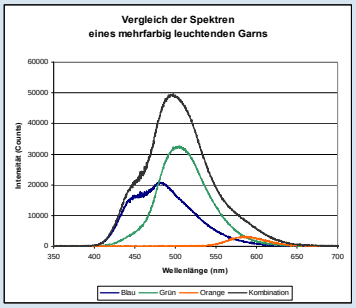

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Combination with sensorical properties

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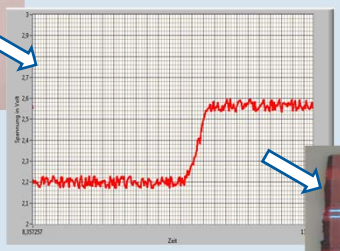
Integration of functions



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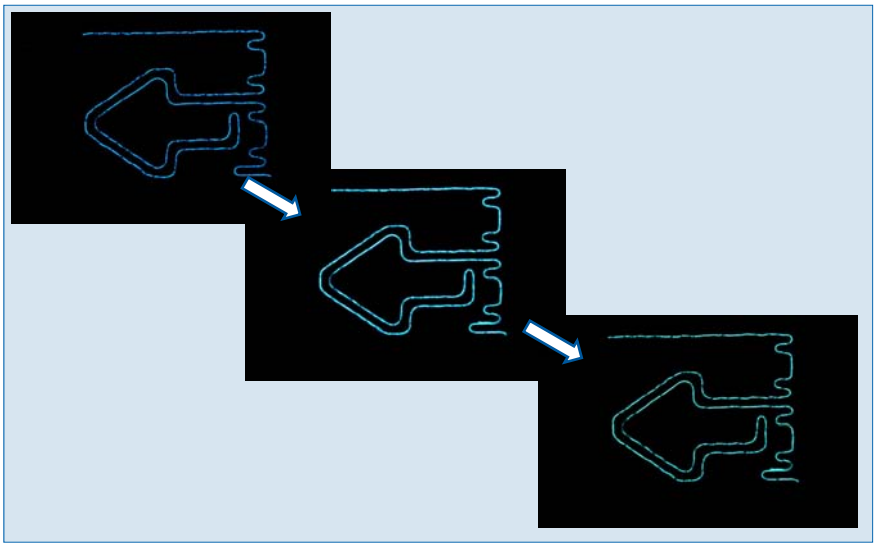
Combination with sensorical properties



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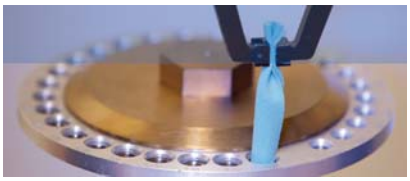
Reliable test labs at ITV Denkendorf

accredited by DAP (German Accreditation Testing GmbH, Berlin) according to DIN EN ISO 17025: 2000

Burning behavior

Stiffness in bending



Gripp, touch

Color matching

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Reliable labs at ITV Denkendorf

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- Standard testing methods and application-orientated tests acc. to spec.
- Cause analysis of damage of any textile product
- Analysis of the influences of processing agents on material properties
- Determination of functional properties like burning/electrostatic behavior, emission, color fastness, filter effect, surface and environmental properties, particle emission of clean-room clothing, barrier properties of protective and OP textiles, water vapor transport, heat insulation
- Chemical and physicochemical tests on elastomers and other plastics
- Environmental simulation – et. al. identification of light fastness and hot light ageing
- Consultancy and quality assurance and control of testing equipment
- Assessment of quality management systems (e.g. ISO 9000 : 2000)
- Determination of transmission, directed reflection and absorption for the areas UV (200 nm to 380 nm), VIS (380 nm to 780 nm), NIR (780 nm to 3 µm) and MIR (3 µm to 25 µm)

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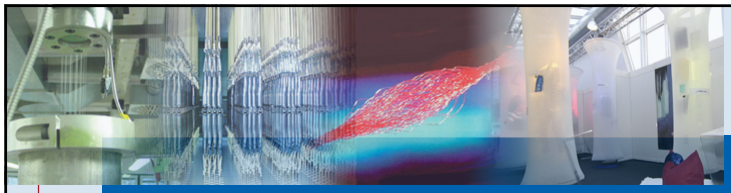

Thank you very much for your attention!

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