

Cell Solution®



a product of smartpolymer

smartpolymer

Functional and Structural Polymeric Materials

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Outline

- ❖ TITK Group
- ❖ Cell Solution® fiber family
- ❖ Basic Idea
- ❖ **Cell Solution® CLIMA (PCM)**
- ❖ **Cell Solution® SKIN CARE (Vitamin E)**
- ❖ **Cell Solution® SKIN CARE Lanolin**
- ❖ Functionalities
- ❖ fibre data

TITK Group

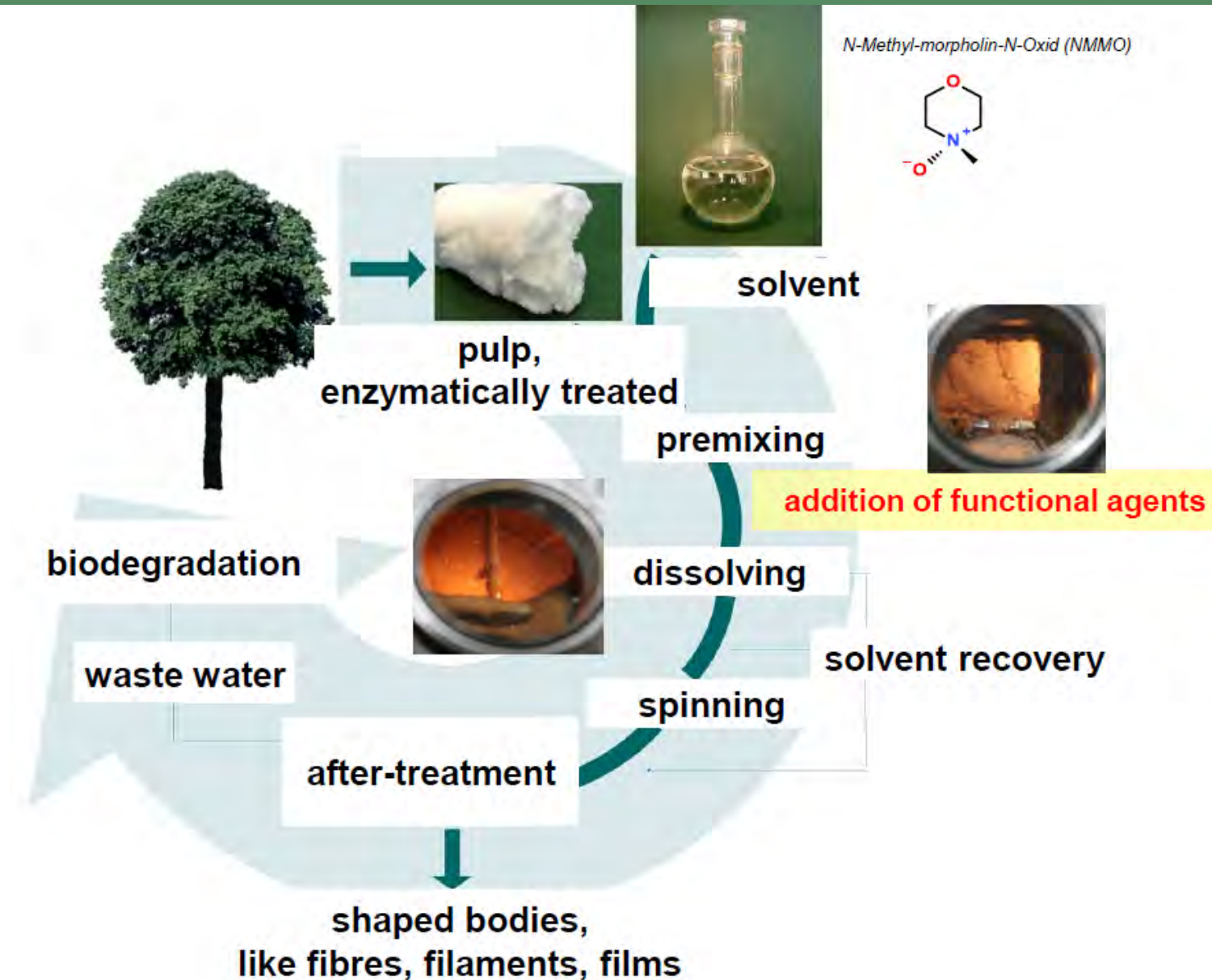



smartpolymer`s product portfolio

Cell Solution® fiber family:

- | | |
|-----------------------------------------|----------------------------------------------------------|
| (1) Cell Solution® CONDUCTIVE | - carbon black |
| (2) Cell Solution® BIOACTIVE | - silver, copper, zinc ions |
| (3) Cell Solution® ALGEA CONTROL | - Benthopos |
| (4) Cell Solution® ACTIVE CARBON (IL) | - active charcoal |
| (5) Cell Solution® PRUSSIAN BLUE (IL) | - adsorption TI ⁺ and Cs ⁺ - ions |
| (6) Cell Solution® CERAMIC | - piezoceramic, AL ₂ O ₃ ceramic |
| (7) Cell Solution® XR PROTECTION | - BaSO ₄ , Bi ₂ O ₃ |
| (8) Cell Solution® HEAT DISPERSION (IR) | - ceramic powder |
| (9) Cell Solution® ADSORPTIVE | - adsorption of liquid impurities |
| (10) Cell Solution® ADSORPTIVE | - adsorption and desorption of ions |
| (11) Cell Solution® CLIMA | - paraffin |
| (12) Cell Solution® PROTECTION | - insecticide |
| (13) Cell Solution® SKIN CARE | - vitamins, essential fatty acids, Lanolin |
| (14) Cell Solution® ODORANT | - scents |
| (15) Cell Solution® FLAMERESISTANT (FR) | - melamine derivatives |
| (16) smartcell® sensitive | - ZnO ⁺ , MgO ⁺ and other minerals |
| (17) Cell Solution® COMFORT (C) | - ITO, ATO, STIR® ceramic |

Lyocell process



A man wearing a thick fur hat is looking out into a snowy environment. A lantern is visible on the right side of the frame. The background is dark with falling snow.

Cell Solution®



CLIMA

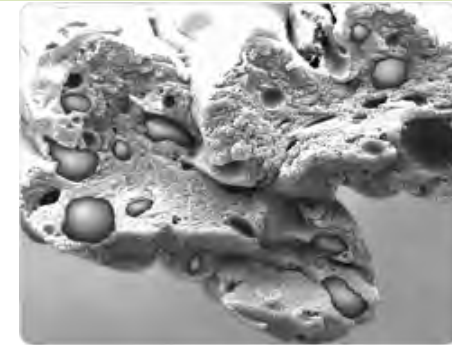
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Cell Solution® CLIMA

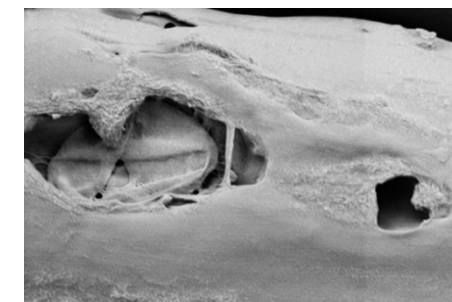
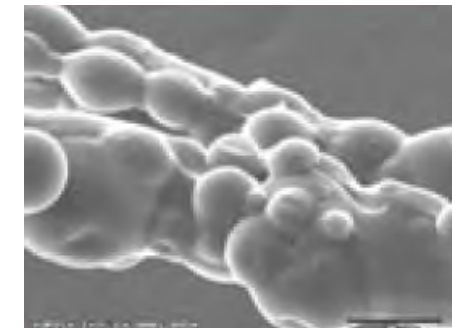
Unique temperature regulation

State of the art:

- Direct incorporation of meltable or volatile lipophilic additives (PCM, carboxylic acids, ...)
- ... by means of encapsulated additives and fibers or fabric after-treatment, only!
- Main disadvantages:
 - high demands on uniformity of capsules sizes,
 - limitation of incorporated amount of capsules and
 - high damage of capsules during mechanical stress at textile fibers processing




REM images showing fiber with PCM capsules and bumpy surface.



New patent (WO 2009/062657 A3)

- **Direct incorporation of lipophilic additives into fibers**

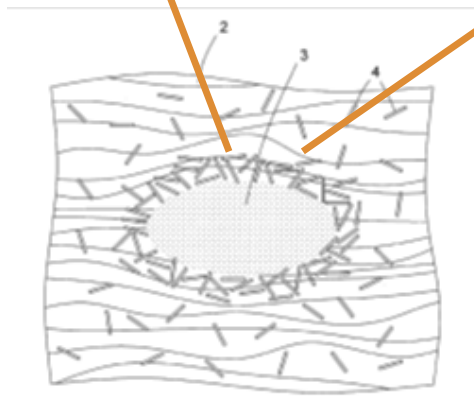
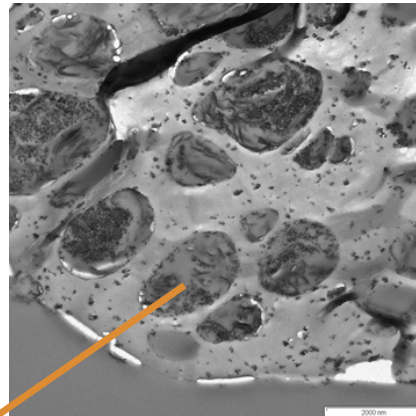
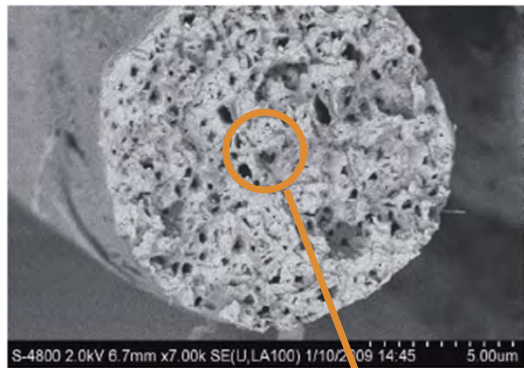


Thermodynamic incompatibility of hydrophilic cellulose and lipophilic PCM wax has to be overcome by PCM composites, which allows permanent incorporation.

Fiber analysis

Cell Solution® -

A new Lyocell type fiber with active agents



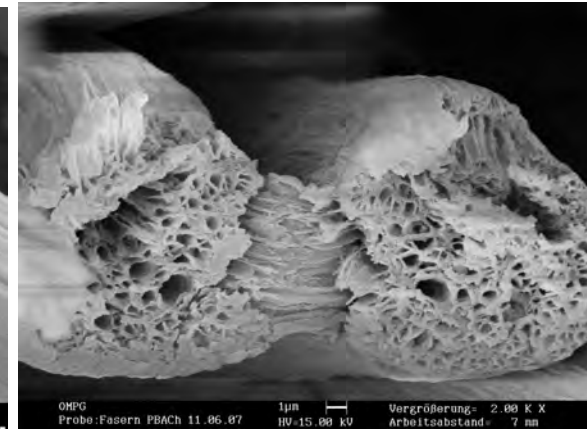
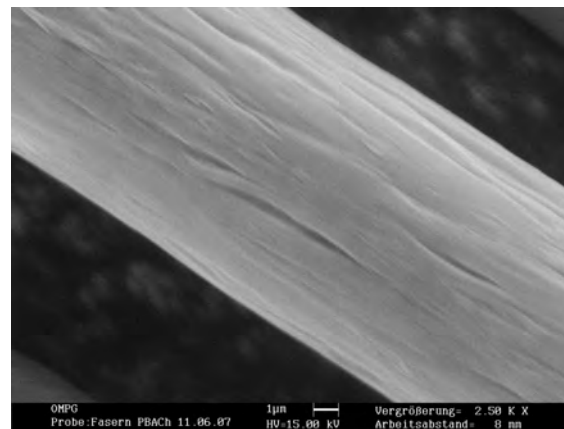
What is new?

- Incorporation of lipophilic Substances inside nano-composite structure.
- Layered silicates assure phase interaction.
- Nano-particles fix the incorporated lipophilic composite.
- **Depot** of lipophilic substance
- **No microcapsules; no coating**
- An easy and long lasting storage system of active agents (**Paraffin as carrier**)

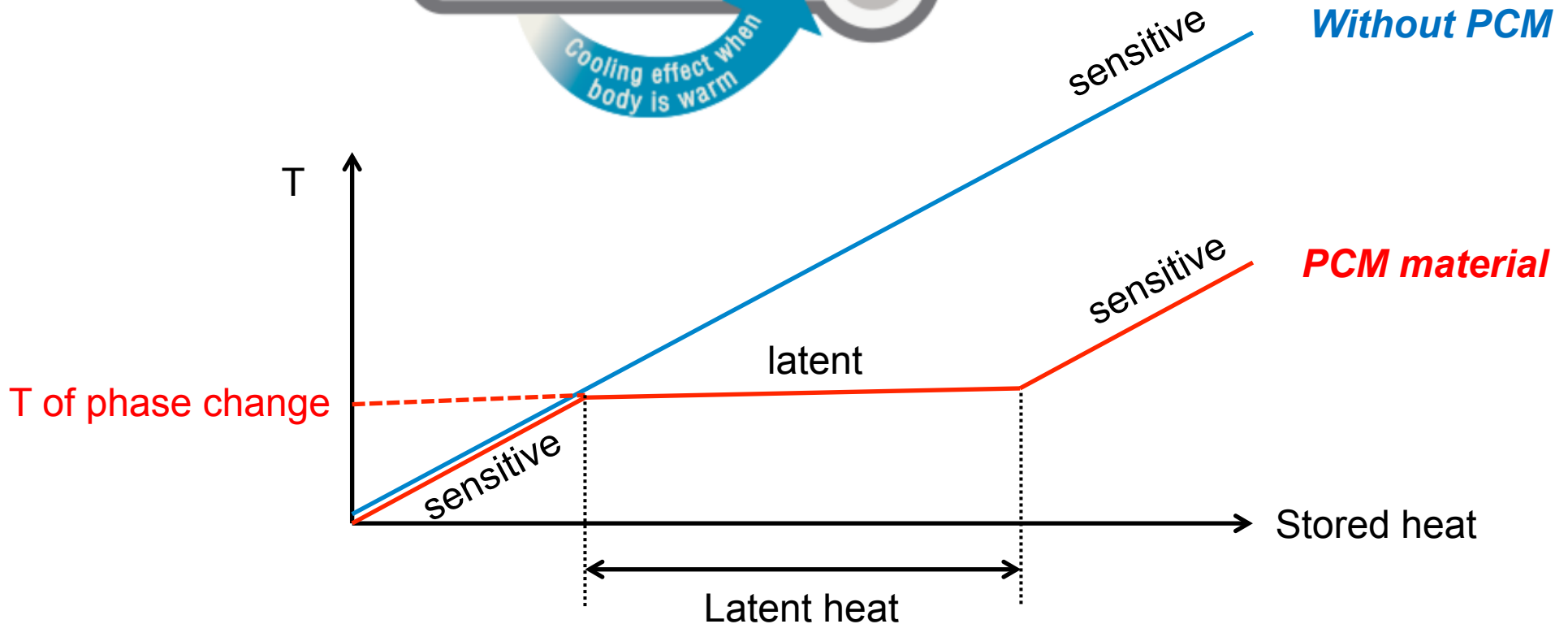
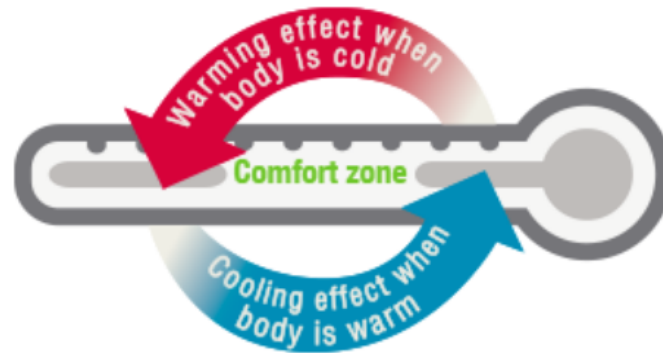
Paraffin as phase change material (PCM)

- Cell Solution® CLIMA fiber is a PCM micro composite of latest generation with thermo-regulating features.
- Functional improvement compared to classic PCM.
- Paraffin is embedded in highly crystalline lyocell fibers forming many micro composite accumulators per unit of cellulose.
- Hence, greater heat storage capacity can be achieved.
 - up to 70 J/g for fiber 6.7 dtex
 - up to 50 J/g for fiber 2.3 dtex

REM images of smooth fiber surface and cross-section. During fiber spinning length orientation results in layers side-by-side.

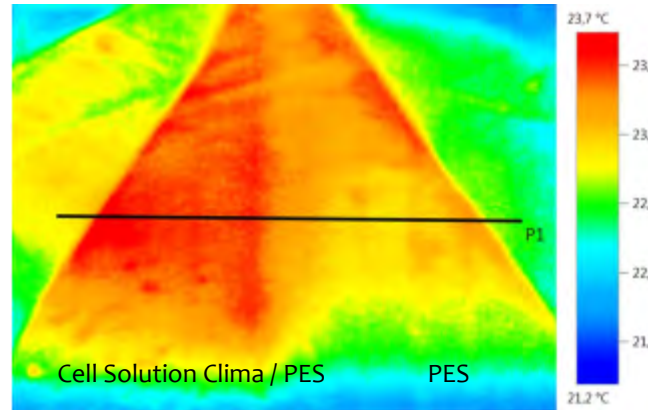
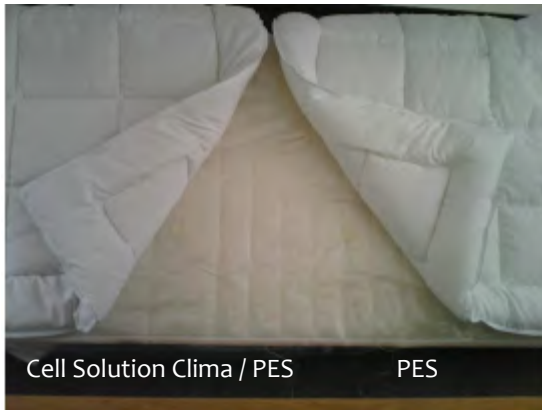


Paraffin as phase change material (PCM)

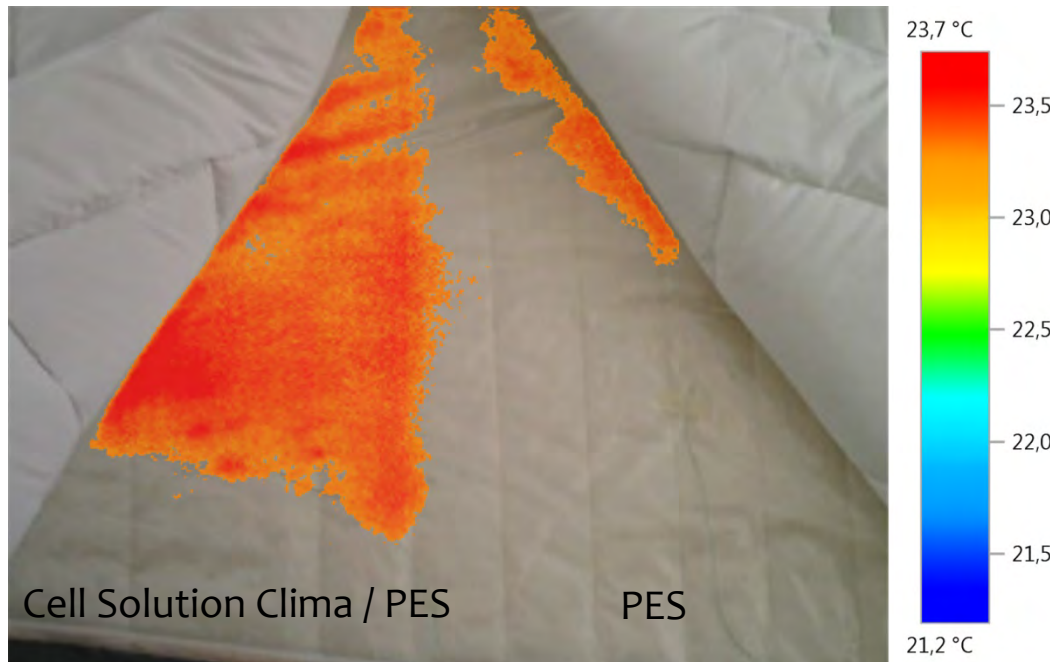
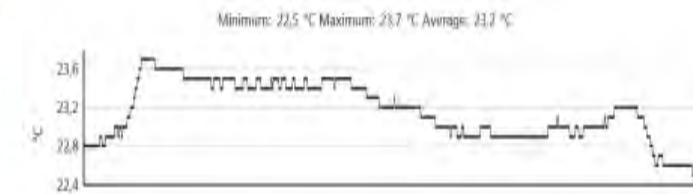


Cell Solution® CLIMA

Effect of PCM in Blankets



Profile line



➤ After 95 min cooling
 Cell Solution® CLIMA remains
 warmer.

Cell Solution® CLIMA



Results of bio-compatibility assessment

➤ Cell Solution® CLIMA Lyocell staple fibers meet the human-ecological requirements of the Oeko-Tex® Standard 100 presently established for baby articles.



Tested for harmful substances.
www.oeko-tex.com/standard100





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Cell Solution® SKIN CARE

Life-long skin care

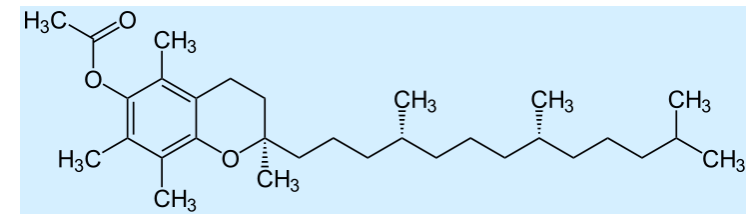
Cell Solution® SKIN CARE

Launch of a new anti-aging

➤ Cell Solution® SKIN CARE implies a continuous skin care by large-scale transfer of **vitamin E acetate (α-tocopheryl acetate)** on human skin.

➤ Vitamin E has special properties:

- To capture free radicals
- To repair and to regenerate damaged skin surface
- To support the moisture regulation of the human skin.




➤ Release of vitamin E turns into a life-long effect.

➤ Textiles, which have a close contact to the body, getting an unknown importance for care and well-being.

➤ Other active substances such as natural oils or medicines can be incorporated into the cellulosic structure besides vitamin E.

UV irradiation protection

- **Repair and regeneration of damaged skin surface**
- UV protection substances absorb irradiation at around 310 nm (Maximum of sun light. This region is necessary for desired preservative **suntan**).
- Absorption maximum of Vitamin E is 290 nm.  Light protection of vitamin A is caused by special other molecular effects, additionally.
- Sunburn-causing UV light dosage is clearly enhanced by vitamin E before and **after** irradiation.

H. Möller, A. Ansmann and S. Wallat: Fat Science Technology, 91. Jahrgang, Nr. 8, 1989:

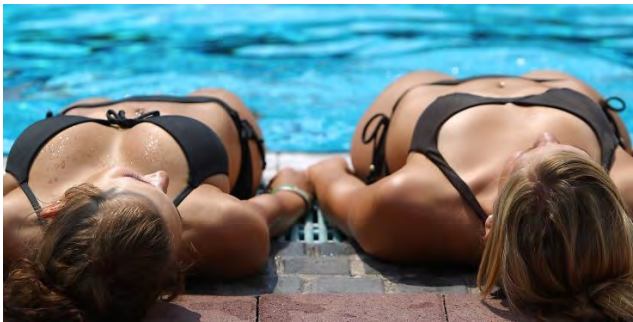
... In einem anderen Fall konnte gezeigt werden, dass akute Hautschädigungen, die durch UV-Licht ausgelöst wurden, von einer verstärkten Aktivität der Ornithindecaboxylase (ODC) begleitet sind und sich diese erhöhte ODC-Aktivität durch topisch angewendetes α -Tocopherylacetat wieder erheblich senken ließ. Bei Anwendung von 100%-igem α -Tocopherylacetat konnte der ODC-Anstieg nahezu vollständig verhindert werden.

Cell Solution® SKIN CARE

UV irradiation protection

- Healthy preservative suntan

Sun blocker



+

Skin Care after sun bath



Cell Solution® SKIN CARE



Results of bio-compatibility assessment

➤ Cell Solution® Skin Care Lyocell staple fibers meet the human-ecological requirements of the Oeko-Tex® Standard 100 presently established for baby articles.

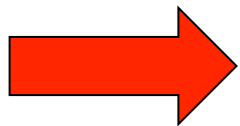


Cell Solution® SKIN CARE



Bio-compatibility assessment

- Materials with contact to human skin have to be declared regard to cell damage or growth.
- In-vitro cytotoxicity of DL-tocopherol fibres according to DIN 10993-5.
- Human HaCa-T-Keratinocyte cell line with complete epidermal differentiation capacity.



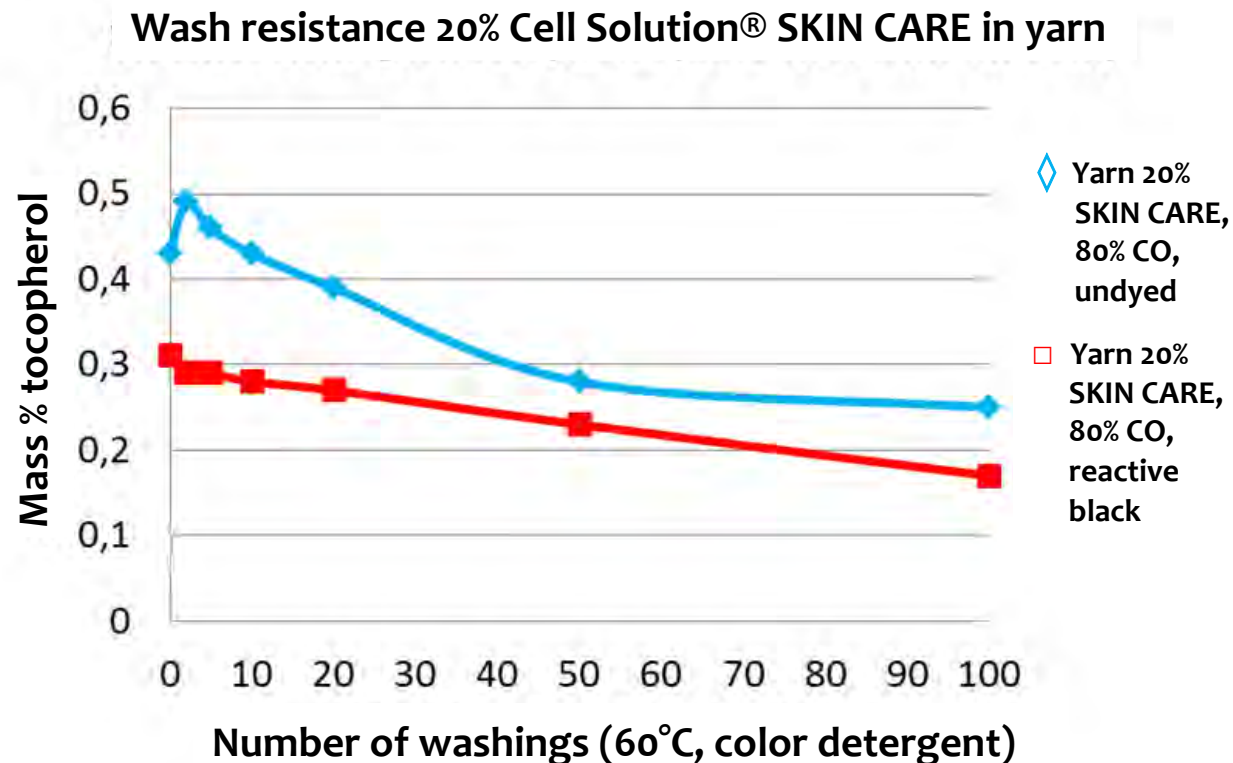
Cell Solution Skin Care® Lyocell staple fibers show no cytotoxicity meaning improved proliferation of human cells can be expected.



Cell Solution® SKIN CARE

Washing and bleaching durability of yarn

- After **100 washing cycles** at 60°C even 60 % of the initial tocoferol content can be detected.
- Reactive dyeing lowers the content to ca. 70 %, after 100 washing cycles of dyed yarn contains ca. 40 % of initial tocoferol.



Cell Solution® SKIN CARE

Measurement of active substance transfer to the skin

- **1,29 mg/m²** of tocopherol (vitamin E) pass-over from the textile to artificial skin model (Human®skin)

(Hohenstein Institute / Germany: Test report no. 14.8.5.0091, August 12, 2014)



Cell Solution® SKIN CARE

Product Data Sheet

Cell Solution® SKIN CARE - 2,3 dtex, 38 mm

➤ Cellulose fiber with vitamin E embedded in paraffin, produced according to the Lyocell – process

➤ Fiber composition in mass % at conditioned state:

- | | |
|------------------------------------------------|-------------|
| ▪ Cellulose | > 57 % |
| ▪ Stabilized paraffin of defined melting point | ca. 14 % |
| ▪ Organically modified layered silicate | 8.7 – 9.1 % |
| ▪ Vitamin E- acetate | > 11 % |
| ▪ Finisher content | < 0.5 % |
| ▪ Moisture | < 10.0 % |

NEW: Lanolin



- Wool wax or wool grease
- mixture: long chain esters, alcohols, acids, hydrocarbons
- Emollient effect
- Skin smoothing

Cell Solution® SKIN CARE Lanolin



Cell Solution® Lanolin fibers are natural

- Main raw material is wood pulp
- **Lanolin as active agent**
- **Tocopherol as antioxidant**
- Anorganic stabilizers



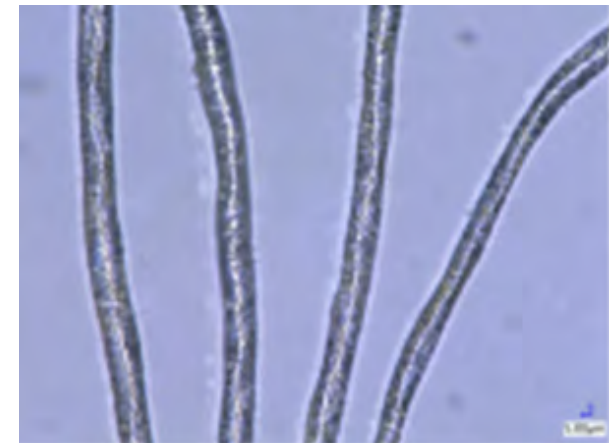
Lanolin

Cell Solution® SKIN CARE Lanolin

- Fibre with **> 15 % Lanolin**
- Smooth fibres for good textile processing
- Sufficient fibre strength



Fibre parameters		V 3190
fineness	dtex	1,75
breaking force cond.	cN	4,92
breaking force variation	%	11,1
elongation cond.	%	13,2
breaking force cond.	cN/tex	28,0
loop strength cond.	cN/tex	8,90
modulus 0,5-0,7%	cN/tex	457



Hautpflegende Faser aus natürlichen Rohstoffen:

- Cellulose (Holz aus nachhaltiger Forstwirtschaft)
- Lanolin aus Schafwolle mit bekannter kosmetischer Wirkung, Pharma-Qualität verfügbar
- paraffinfrei
- Silikate und Vitamin E als Stabilisatoren
- bioabbaubar, kompostierbar
- textile Verarbeitbarkeit möglich
- keine Bildung von Mikroplastik-Partikeln



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