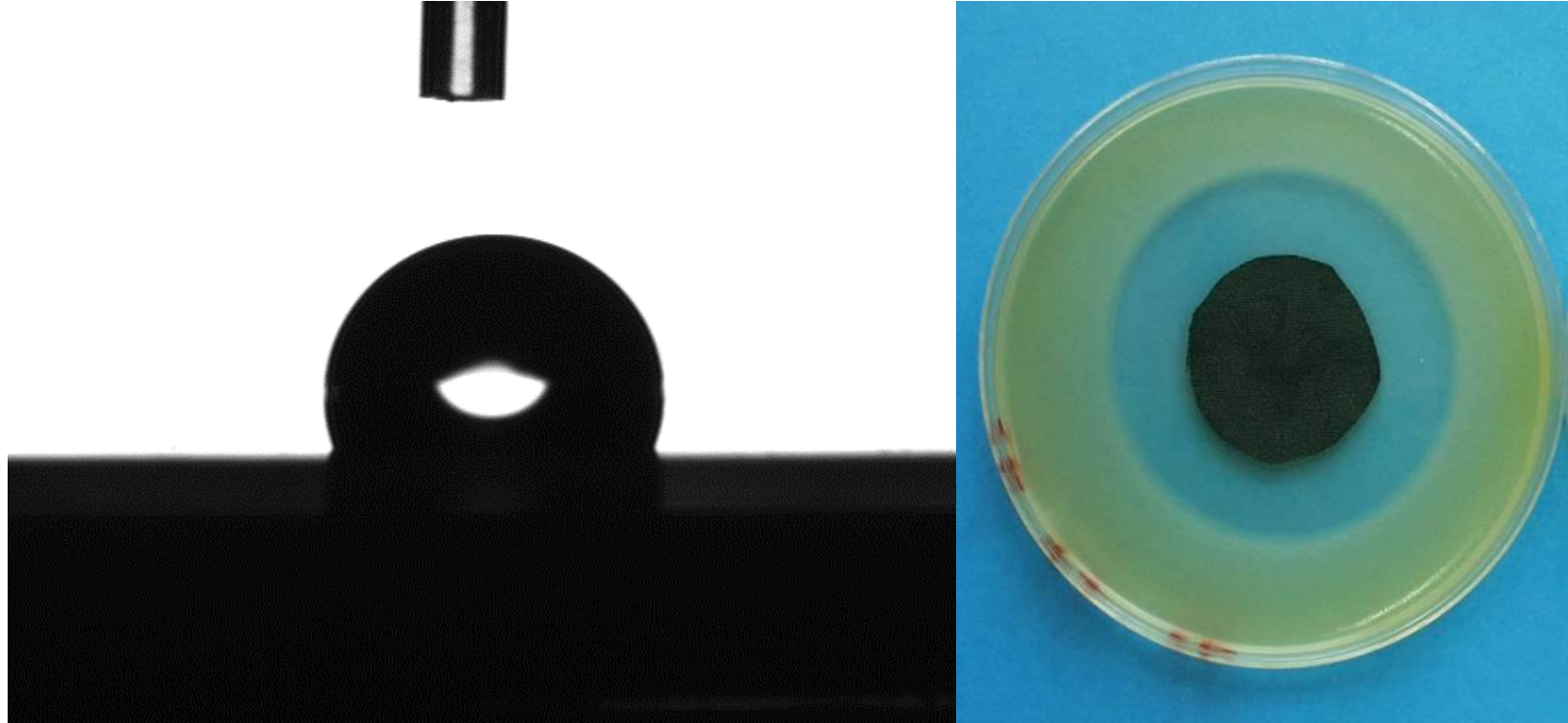




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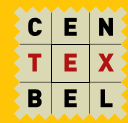


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Avec le soutien du Fonds européen  
de Développement Régional  
Met de steun van het Europees  
Fonds voor Regionale Ontwikkeling

# Duratex project

# David De Smet



# Duratex

- » *Water and oil repellent as well as antimicrobial textiles for building and architectural applications*
- » *Interreg V project France-Wallonia-Flanders*
- » *1/07/2016 – 30/09/2020*

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# Financing

» *Duratex project is financed within the Interreg V France-Wallonia-Flanders program (<http://www.interreg-fwvl.eu/nl>), a transborder collaboration program with financial support of the European Funds for regional development with cofinancing by Wallonia and the province West-Flanders*

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# Need?

- » *Pressure from environmental organisations and consumer*
- » *Legislation*
  - > *Biocide regulation 528/2012*
  - > *REACH regulation (fluorocarbons)*
- » *Label e.g. Oeko-Tex*



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# Oeko-Tex

PFC's, Per- and polyfluorinated Compounds/Per- und polyfluorierte Verbindungen <sup>11,19</sup>				
PFOS, PFOSA, PFOSE, N-Me-FOSA, N-Et-FOSA, N-Me-FOSE, N-Et-FOSE; Sum/Summe[µg/m <sup>2</sup> ]	<1.0	<1.0	<1.0	<1.0
PFOA[µg/m <sup>2</sup> ]	<1.0	<1.0	<1.0	<1.0
PFHpA[mg/kg]	0.05	0.1	0.1	0.5
PFNA[mg/kg]	0.05	0.1	0.1	0.5
PFDA[mg/kg]	0.05	0.1	0.1	0.5
PFUdA[mg/kg]	0.05	0.1	0.1	0.5
PFDoA[mg/kg]	0.05	0.1	0.1	0.5
PFTTrDA[mg/kg]	0.05	0.1	0.1	0.5
PFTeDA[mg/kg]	0.05	0.1	0.1	0.5
Further Perfluorinated carbonic acids, each; according to Annex 5/je; gemäß Anhang 5[mg/kg]	0.05			
Perfluorinated sulfonic acids, each; according to Annex 5/je; gemäß Anhang 5[mg/kg]	0.05			
Partially fluorinated carbonic / sulfonic acids, each; according to Annex 5/je; gemäß Anhang 5[mg/kg]	0.05			
Partially fluorinated linear alcohols, each; according to Annex 5/je; gemäß Anhang 5[mg/kg]	0.50			
Esters of fluorinated alcohols with acrylic acid, each; according to Annex 5/je; gemäß Anhang 5[mg/kg]	0.50			



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# Target group

» Target companies are involved in:

- > *Coating*
- > *Extrusion*
- > *Chemical additives*
- > *Technical textile and interior textiles*

» *All other companies looking for water and oil repellent and/or antimicrobial textile*



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# Transborder collaboration

» *Necessary to realise the objectives*

» *Partners*

> *Centexbel (FL)*

> *Certech (WL)*

> *Ceti (FR)*

> *Ensait (FR)*

> *UCL (WL)*

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# Transborder collaboration

- » Centexbel
  - > *Coordinator*
  - > *Applying biobased antimicrobial products via coating and finishing*
  - > *Assistance in developing superhydro- and oleophobic formulation and application*
- » Certech
  - > *Development of superhydro- and oleophobic formulation*
- » Ceti
  - > *Applying biobased antimicrobials via extrusion on pilot scale*
- » Ensait
  - > *Applying biobased antimicrobials via extrusion and diffusion*
- » UCL
  - > *Development of superhydro- and oleophobic formulation*



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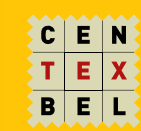
# Results

## » *Antimicrobial textiles*

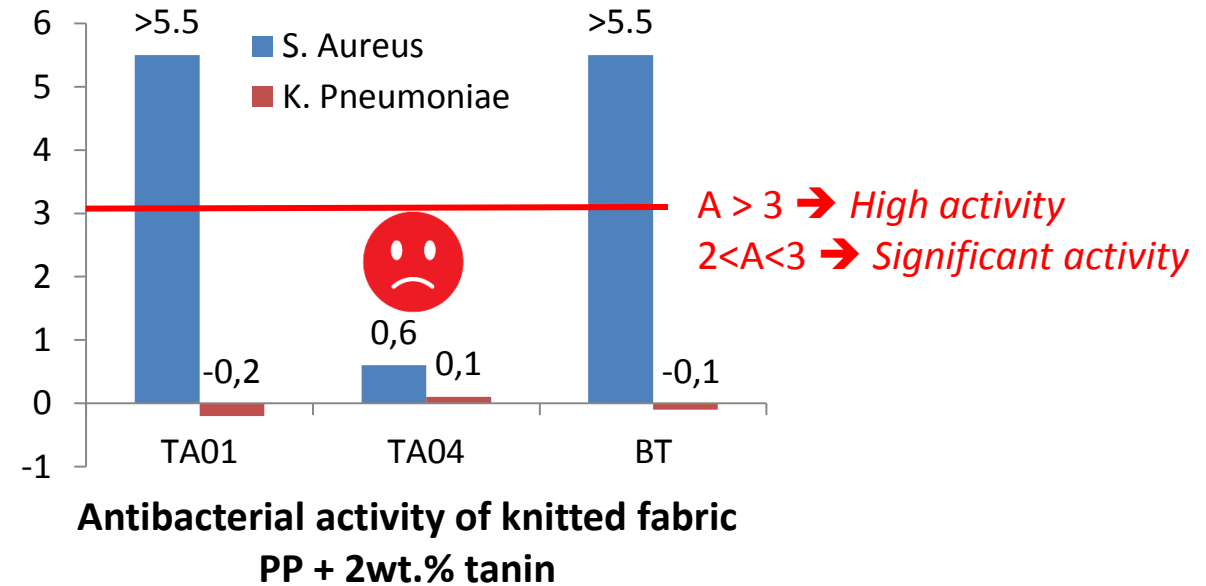
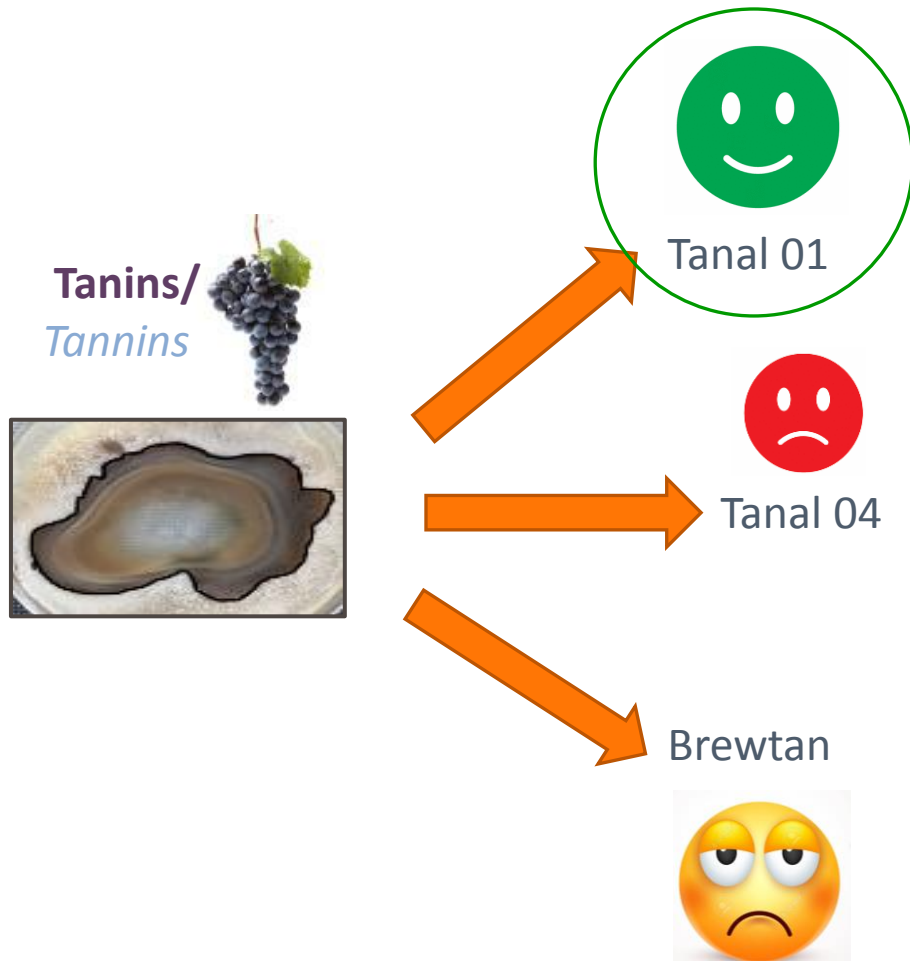
- > *Coating/Finishing*
- > *Diffusion*
- > *Extrusion*

## » *Superhydro- and oleophobicity*

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# Meltspinning of Tanins - Results



**Better dispersion and mechanical properties with Tanal 01**  
**Optimised content is 2 %**  
**No effect with 0.5 and 1 %**



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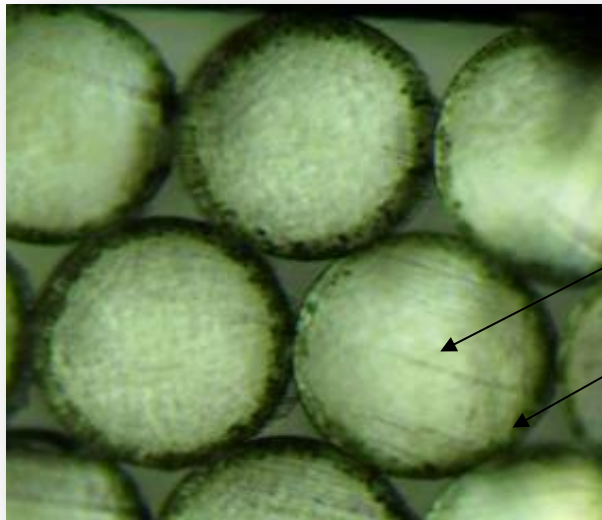
# Optimisation of meltspinning

- Optimisation in bicomponent : PP / PP + 2% tannin



## ✓ Optimisation of the ratio sheath / core

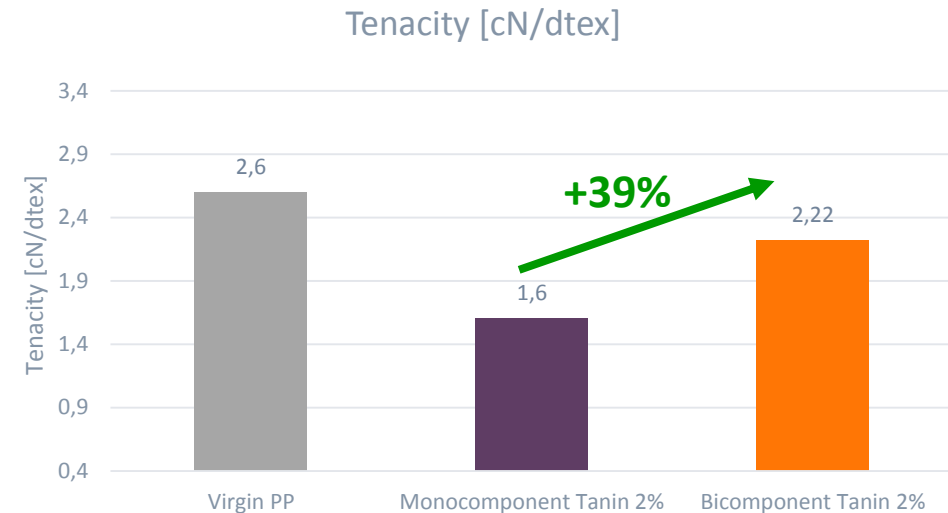
Best ratio : 70% Core / 30% Sheath



70% Core

30% Sheath

## ✓ Mechanical properties



- ✓ By using a bicomponent core-sheath configuration, the **drawing ratio can be increased** compared to monocomponent filaments. **This increases the strength of the filaments by +39%.**



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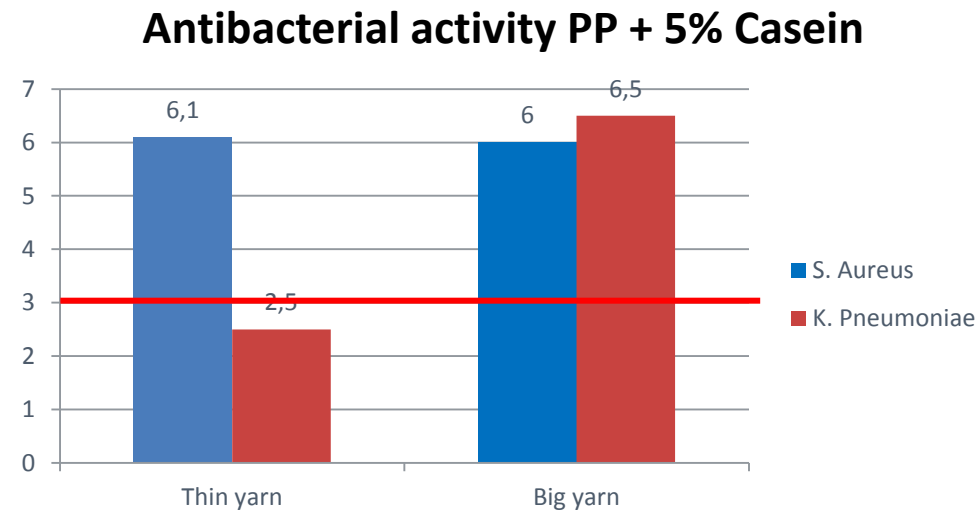


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# Meltspinning of Casein - Results

Transfert test ISO 20743 (Centexbel)



$A > 3 \rightarrow$  High activity  
 $2 < A < 3 \rightarrow$  Significant activity



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# Meltspinning of lignin – Results

## Antibacterial activity

Antibacterial tests were run on knitted fabrics with 2 wt.% of lignins :

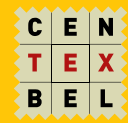
	Kraft Lignin	Domtar Lignin
Gram-positive bacteria Staphylococcus Epidermidis		
Gram-negative bacteria Escherichia Coli		

Antibacterial halo

DL appeared to have slightly better efficiency. Domtar lignin is the best choice.



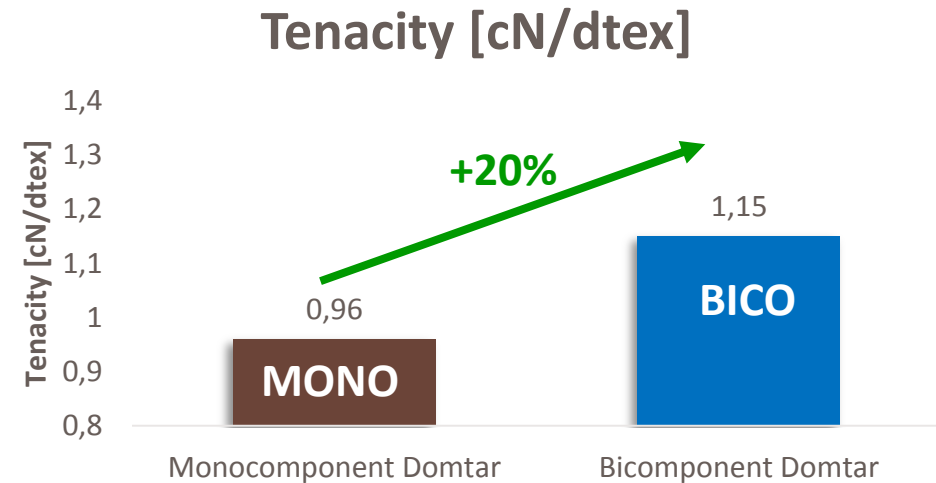
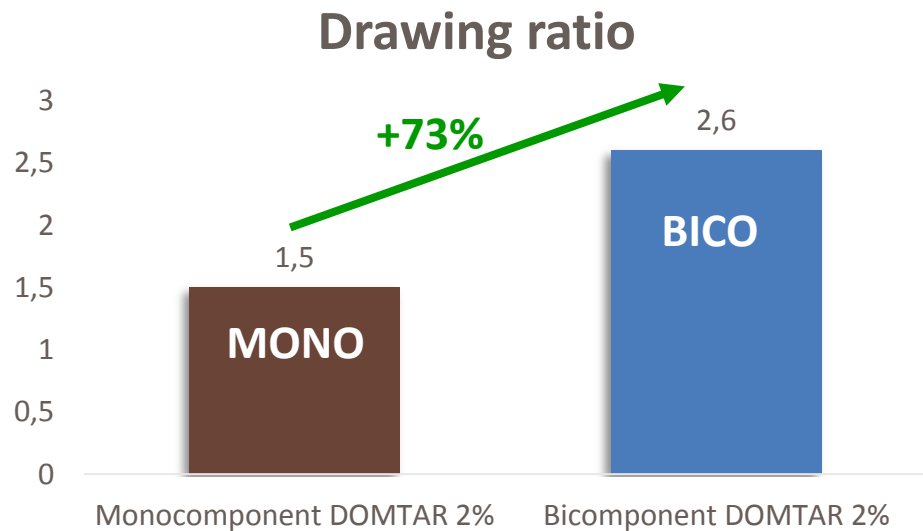
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# Optimisation of meltspinning



- Optimisation of drawing / Mechanical properties



- ✓ By using a bicomponent core-sheath configuration, the **drawing ratio** can be **increased** compared to monocomponent filaments. **This increases the strength of the filaments +20%.**

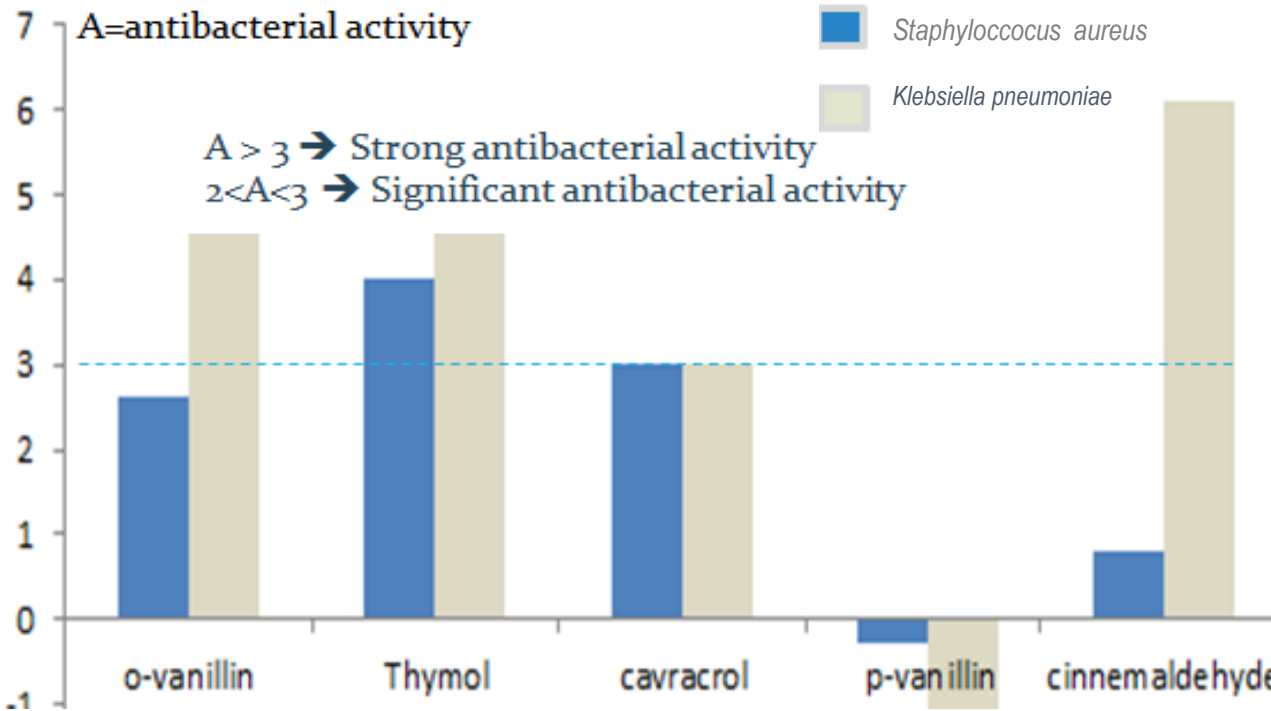
# Active ingredients from essential oils applied via diffusion

Renewable, Bio-based

$\delta$  PET Fiber = 21.4 MPa<sup>1/2</sup>



## QUANTITATIVE ANTIBACTERIAL TEST ISO 20743 (2013) on Textiles:

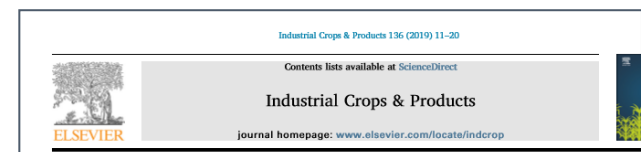


Geraniol

Brewtan

Tanal

$A < 1$



Antibacterial polyester fabrics via diffusion process using active bio-based agents from essential oils  
Pauline Gressier<sup>a</sup>, David De Smet<sup>c</sup>, Nemeshwari Behary<sup>a,b,c</sup>, Christine Campagne<sup>a,b</sup>, Myriam Vanneste<sup>c</sup>

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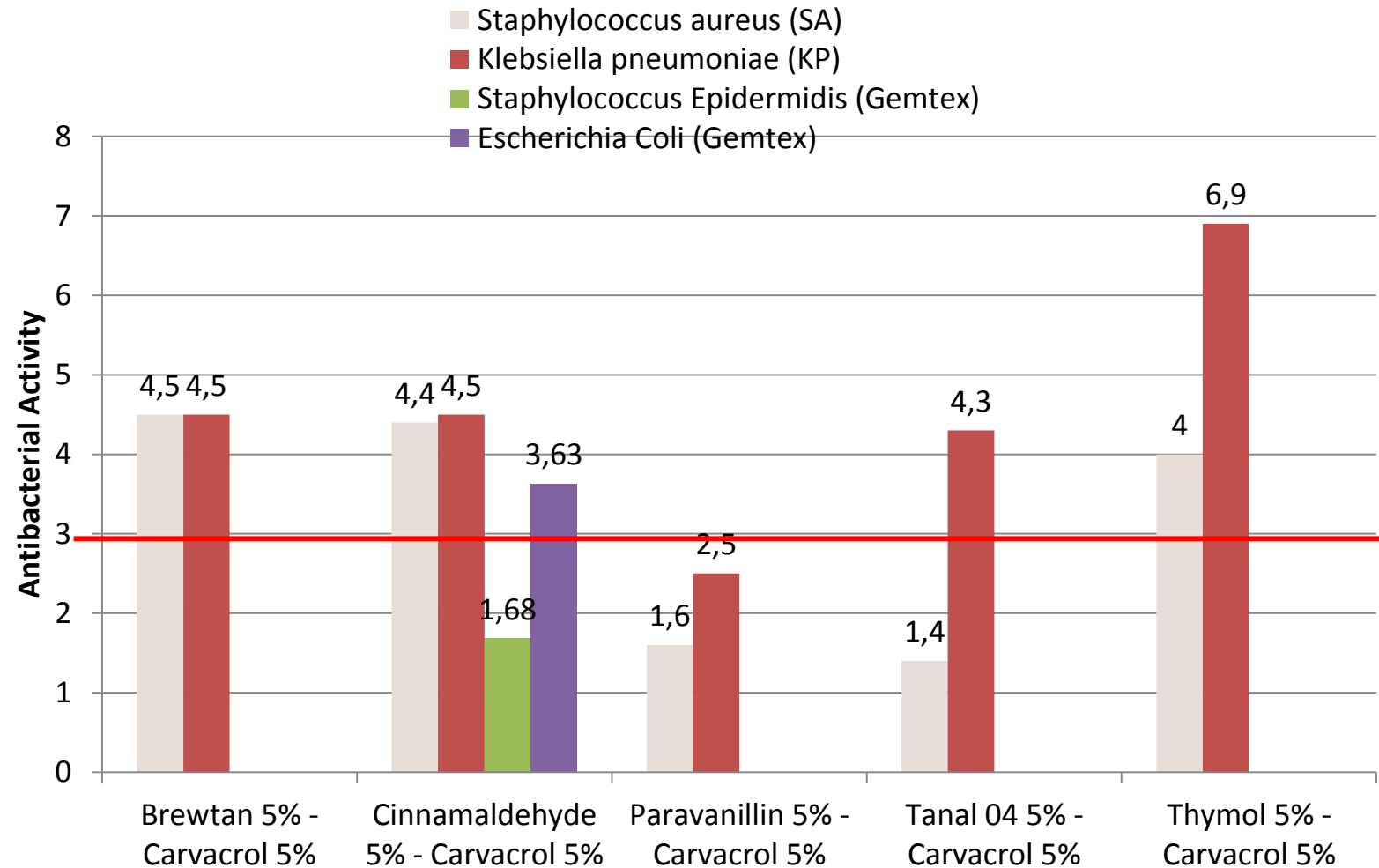
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# Diffusion: active ingredients used in synergy

(Brewtan, Cinnamaldehyde and Thymol)+ cavracrol

A>3 → Strong activity



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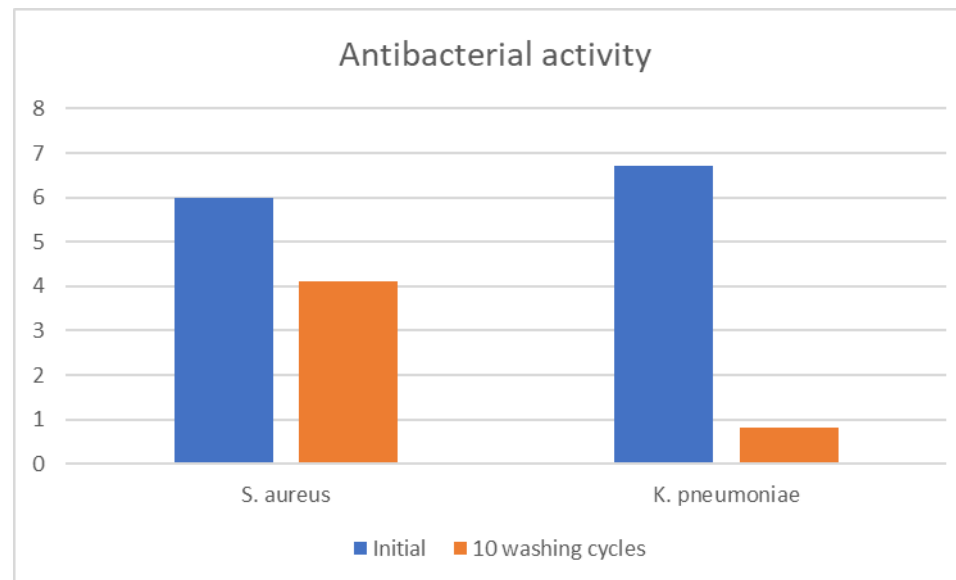
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# Antibacterial bio PUD coating

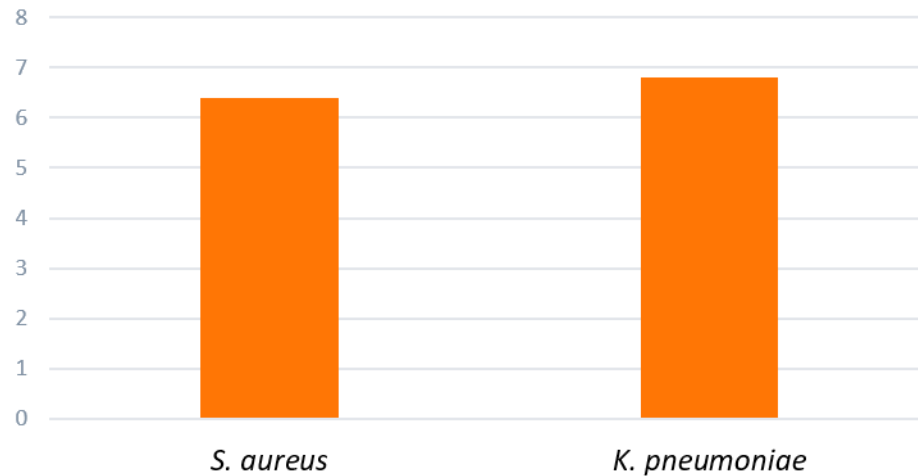
- » Waterbased PU coating functionalised with vanillic acid
- » Washing @ 40°C (ISO 6330)



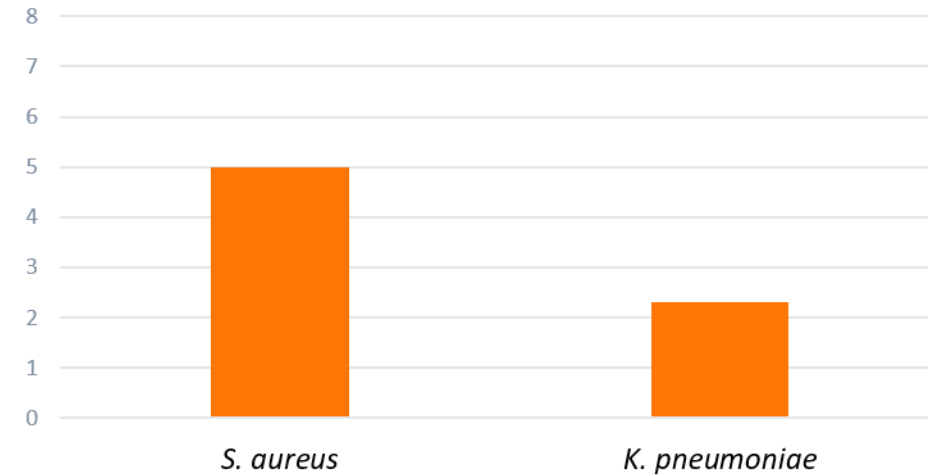
# Antibacterial bio PUD coating

- » Waterbased PU coating functionalised with monolaurin
- » Washing @ 40°C (ISO 6330)

Antibacterial activity before washing



Antibacterial activity after 10 washing cycles



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# Antibacterial 2K PU coating



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## » Biobased 2K PU

### > Monolaurin

+ Significant antibacterial effect against *K. pneumoniae*

### > ISO 20743

<i>S. Aureus</i>	<i>K. pneumoniae</i>
0.3	2.2



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# Antibacterial 2K PU coating



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## » Biobased 2K PU

> Vanillic acid

+ *Strong antibacterial effect against K. pneumoniae and S. aureus*

> ISO 20743

<i>S. Aureus</i>	<i>K. pneumoniae</i>
> 5.7	> 6.7

# Publications

Industrial Crops & Products 136 (2019) 11–20

Contents lists available at ScienceDirect

**Industrial Crops & Products**

journal homepage: [www.elsevier.com/locate/indcrop](http://www.elsevier.com/locate/indcrop)

ELSEVIER

Antibacterial polyester fabrics via diffusion process using active bio-based agents from essential oils

Pauline Gressier<sup>a</sup>, David De Smet<sup>c</sup>, Nimeshwaree Behary<sup>a,b,\*</sup>, Christine Campagne<sup>a,b</sup>, Myriam Vanneste<sup>c</sup>

ISSN: 2641-192X DOI: 10.33552/JTSFT.2020.04.000597

Journal of  
Textile Science & Fashion Technology

Iris Publishers

Research Article

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## Antibacterial and Multifunctional Polyester Textile Using Plant-Based Cinnamaldehyde

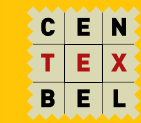
Nimeshwaree Behary<sup>1,2\*</sup>, David De Smet<sup>3</sup>, Christine Campagne<sup>1,2</sup> and Myriam Vanneste<sup>3</sup>

<sup>1</sup>ENSAIT, GEMTEX - Laboratoire de Génie et Matériaux Textiles, F-59056 Roubaix, France

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**Interreg**   
France-Wallonie-Vlaanderen UNION EUROPÉENNE  
EUROPESE UNIE



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