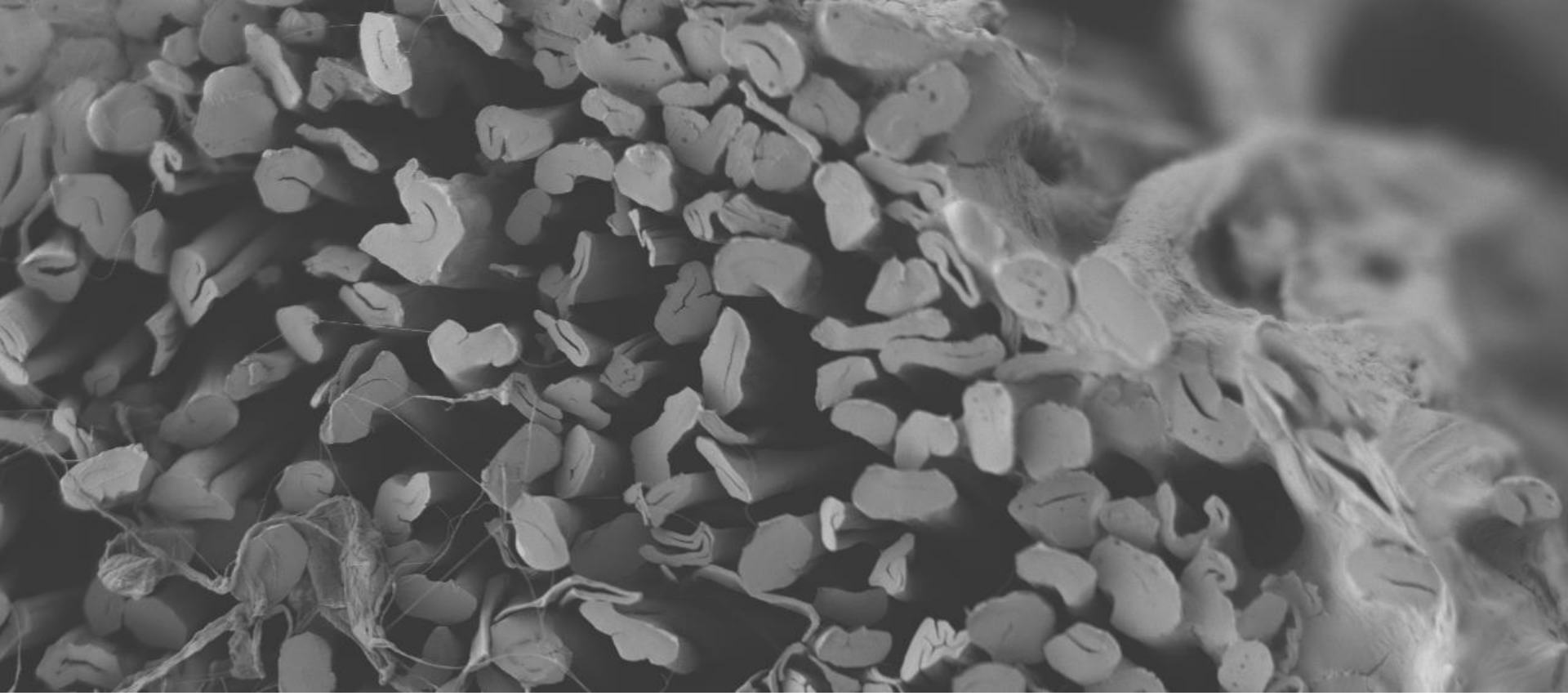

Ecologisch superhydrofoob en antimicrobieel textiel

David De Smet | Infohappening 2018

Outline

- Introduction
- Results
- Conclusions and outlook

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Duratex

- Ecofriendly water and oil repellent and antimicrobial textile

- Transcollaboration
  - Centexbel (VL)
  - UCL and Certech (WL)
  - Ensait and CETI (FR)

Interreg
France-Wallonie-Vlaanderen
UNION EUROPÉENNE
EUROPESE UNIE

met de steun van
west-vlaanderen
de gedreven provincie

Wallonie

GoToS3
DURATEX

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

PFOA and REACH

- PFOA is put on the SVHC list of REACH: obligation of communication in Europe in case PFOA > 0.1% (g/g)
- Maximum concentration for PFOA of 25 ppb and for PFOA related substances 1000 ppb
- Start from 4/7/2020 (PPE: 4/7/2023)

PFOA and REACH

- Replace C8 FC chemistry by C6 or C4 FC products, other fluorine products or even fluorine free water repellents

- Short chains FC are under scrutiny

- Attention should also be paid to silicone-based products due to their likely impurity content of siloxanes such as octamethylcyclotetrasiloxane and decamethylcyclopentasiloxane, substances which have already been restricted for wash-off personal care products.

PFOA/PFOS determination

- Ultrasonic extraction with methanol and HPLC/MS detection

Deviation from the standard	-
Extraction method	Methanol ultrasonic
Separation and detection	RP-HPLC with MS detection

Results

Determination limit — See table

Compound	C (mg/kg)
PFHpA	< 0.01
PFNA	< 0.01
PFDA	< 0.01
PFUdA	< 0.01
PFDoA	< 0.01
PFTrDA	< 0.01
PFTeDA	< 0.01
PFBA	< 0.01
PFPeA	< 0.01
PFHxA	< 0.01
PF-3,7-DMOA	< 0.01
PFBS	< 0.01
PFHxS	< 0.01
PFHpS	< 0.01
PFDS	< 0.01
7HPFHpA	< 0.01
4HPFUnA	< 0.01
1H, 1H, 2H, 2H-PFOS	< 0.01

Compound	C (µg/m²)
Sum PFOS, PFOSA, PFOSE, N-Me-FOSA, N-Et-FOSA, N-Me-FOSE, N-Et-FOSE	< 1.00
PFOA	< 1.00

PFOA/PFOS telomer alcohol detection

- Ultrasonic extraction and GC/MS/MS detection

Deviation from the standard	-
Extraction method	Ultrasonic extraction with methanol
Analytical method	GC/MS/MS

Results

Determination limit 0.10 mg/kg

Components	C (mg/kg)
4:2 FTOH	< 0.10
6:2 FTOH	< 0.10
8:2 FTOH	< 0.10
10:2 FTOH	< 0.10
6:2 FTA	< 0.10
8:2 FTA	< 0.10
10:2 FTA	< 0.10

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Ecofriendly FC free superhydrophobicity

- Waterbased dip coating process (3 layers)
- Can be easily integrated into standard textile industrial processes
- PDMS + silica particles

Ecofriendly FC free superhydrophobicity

- Contact angle: 145° and roll-off angle: 0-2°
- https://www.youtube.com/watch?v=QI165i-vgLE
- *Environment-Friendly Super-Water-Repellent Fabrics Prepared from Water-Based Suspensions, ACS Applied Materials & Interfaces 10 (18)*, DOI: 10.1021/acsami.8b02707

Biobased antimicrobial products

- Plant, animal or marine origin
- Phenolic, ammonia/amine groups,…
- Efficacy depending on:
  - Fabric type (chemistry)
  - Structure of the textile
  - Fabric weight

Biobased antimicrobial products

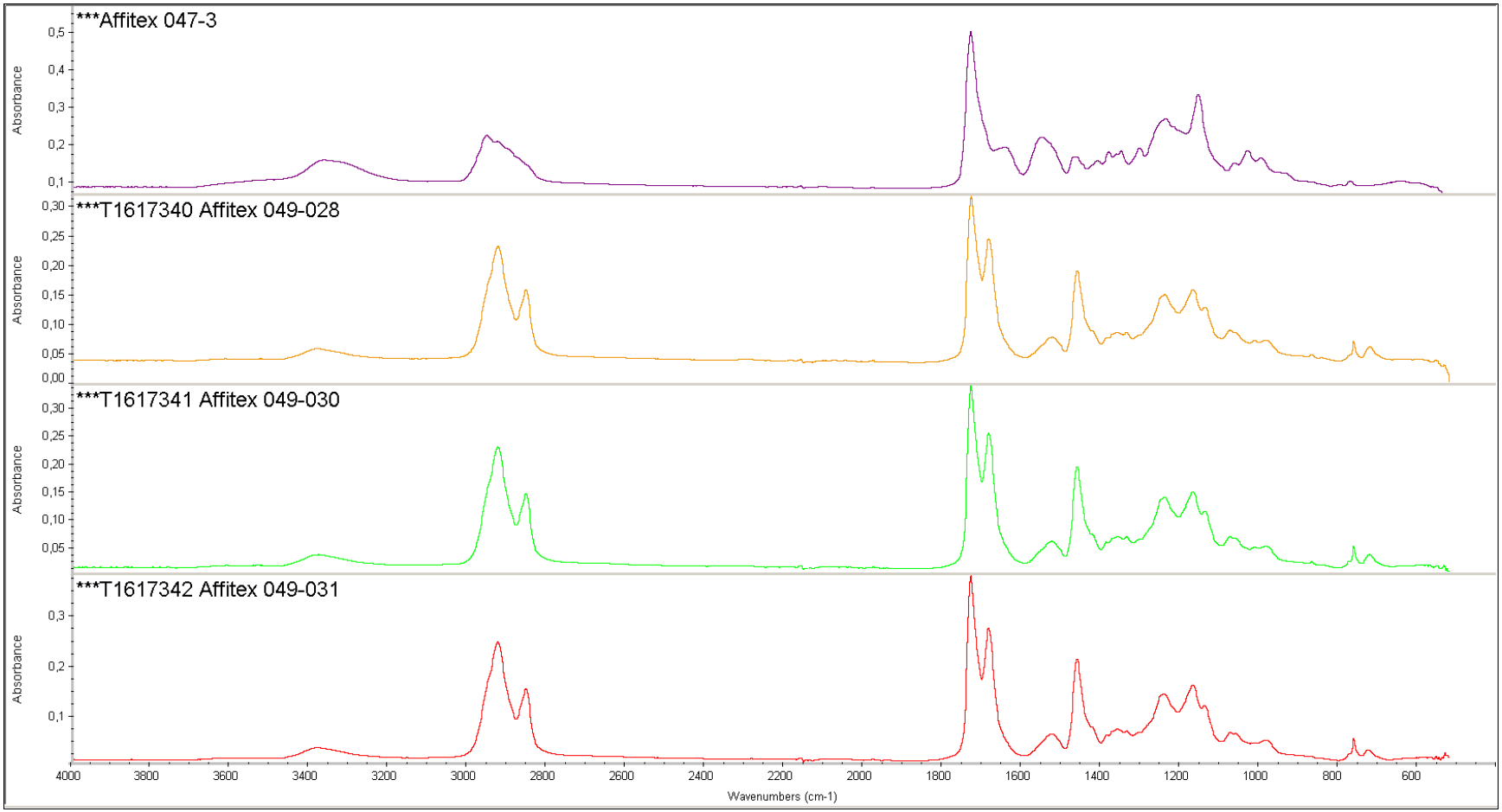
- Active against *S. aureus*
  - Ellagic acid
  - Monolaurin

- Active against *S. aureus* and *K. pneumoniae*
  - Dodecanoic acid
  - Berberine chloride
  - Curcumin
  - Vanillic acid

Biobased 2K polyurethane

- 2K system
  - Biobased polyol + biobased isocyanate
  - Ratio depending on hydroxyl content
  - Non-toxic tin free catalyst
- Excellent potlife for 2K systems
- Curing: 2 min @ 155°C

Biobased 2K polyurethane



Biobased 2K polyurethane

- Compatible with additives (not waterbased)
- Flexible coating
- Not sticky and slip resistant

Biobased 2K polyurethane

- Good abrasion and QUV resistance
- Wash fastness (min. 20 cycles @ 40°C)
- Hydrostatic head> 10m (after 10 washing cycles @ 40°C)
- Not weldable

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Conclusions and outlook

- Biobased polyurethanes are promising candidates for renewable textile coatings
- Biobased non-toxic antimicrobial additives are available but not registered yet
- Fluorfree superhydrophobic finish suitable for different substrates

Conclusions and outlook

- One-pot fluorfree superhydrophobic system is developed and applicable via padding and spraying
- Superoleophobic finish is being optimised
- Renewable non-isocyanate biobased polyurethanes will be assessed for textile coatings

Questions ?

dds@centexbel.be
+32 9 241 86 84