

PFAS-FREE Results



**Funded by
the European Union**
NextGenerationEU



Safe and Sustainable Water Repellency for Textiles

PFAS FREE is a collaborative research project dedicated to developing high performance, fluorine free water repellent finishes for textiles, designed from the outset according to Safe and Sustainable by Design (SSbD) principles.

Conventional PFAS based water repellents are persistent, bioaccumulative and toxic, raising serious concerns for both the environment and human health. With 50–80 kilotonnes of PFAS used annually in textile applications, the need for effective and sustainable alternatives is urgent.

A Multidisciplinary, SSbD Approach

The PFAS FREE project brings together complementary expertise in materials science, sustainable chemistry and environmental assessment:

- **Centexbel** developed innovative biobased, fluorine free hydrophobic polymers.
- **UCLouvain** introduced a novel surface nano structuring finishing process to enhance water repellency
- **UGent** and **ULiège** assessed the solutions using SSbD criteria, including life cycle assessment (LCA), biodegradability and ecotoxicity.

This combination of chemical innovation and physical surface design enables high performance without relying on harmful fluorinated compounds.

High Performance Without PFAS

Centexbel developed biobased a water repellent that was applied to polyester fabric and evaluated using standard spray tests:

- Excellent initial performance with a spray score of 5 (no wetting)
- Durable water repellency, maintaining a spray score of 4 after 25 domestic wash cycles (40 °C)

By comparison, a commercially available fluorine free water repellent showed a sharp performance decrease, dropping to a spray score of 2 after only 15 washes.

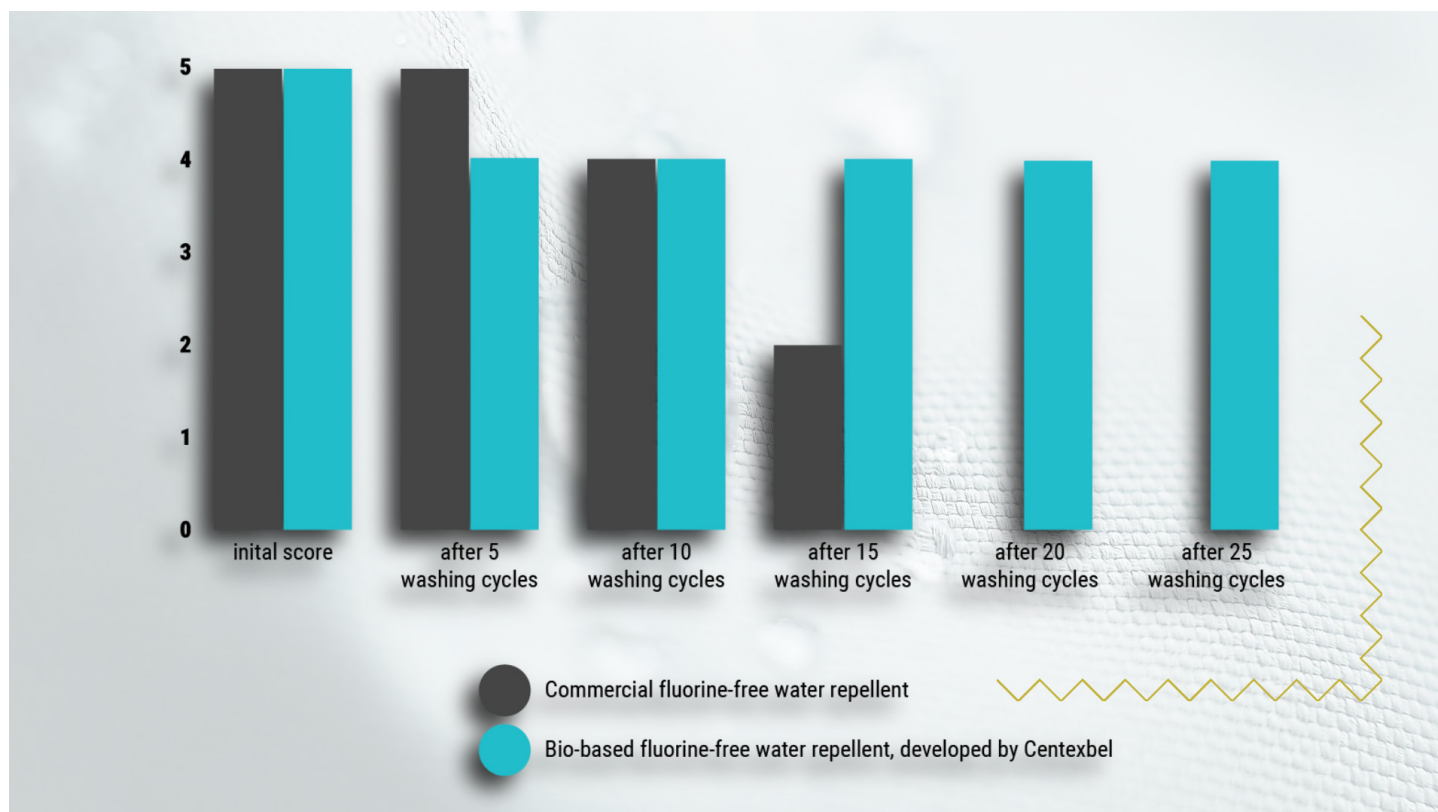


Figure 1: Spray test on polyester fabric treated with the biobased water repellent developed by Centexbel and a commercial water repellent.

Enhancing Water Repellency Through Nano Structuring

UCLouvain developed an innovative PFAS free nano structuring technique, applied during textile finishing using biosourced emulsions.

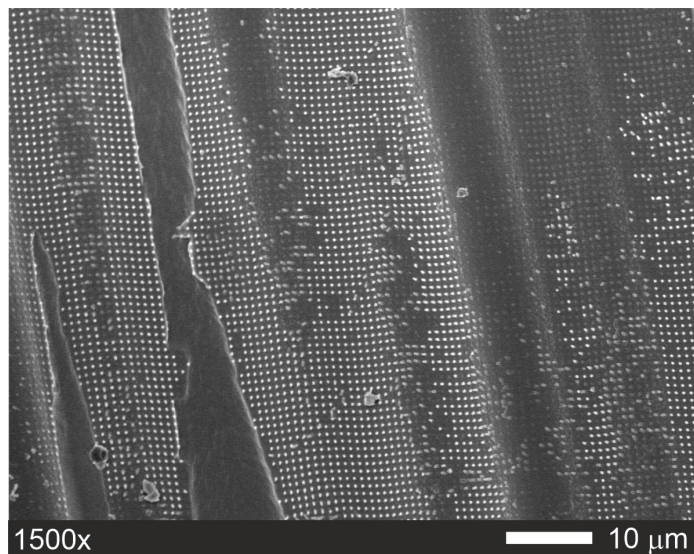


Figure 2. SEM micrograph of a nano-structured fabric

This controlled increase in surface roughness:

- Improves water repellency of smoother fabrics
- Transforms fabrics from water impregnated to superficially wet states
- Complements chemical substitution with physical surface design

Advanced mathematical modelling revealed the combined role of:

- Fabric weave pattern
- Fibre packing inside yarns
- Nano structuring of the fibre surface

This opens new pathways towards performance-driven, PFAS free textile design.

Proven Environmental and Health Benefits

Biodegradability & Ecotoxicity (UGent)

- Biobased water repellents showed higher biodegradability than a commercial reference product.
- Lower ecotoxic effects were observed across multiple organisms and trophic levels, including algae, crustaceans and freshwater snails.
- No adverse ecotoxic effects were detected.

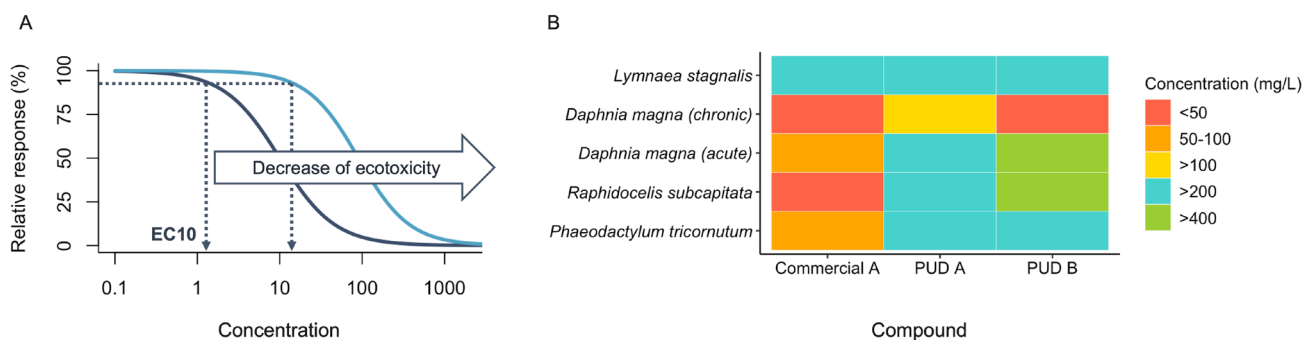


Figure 3. Ecotoxicity of novel biobased water-repellents (PUD A and PUD B) compared to a reference product Commercial A. (A) Graphical representation of ecotoxicity expressed as the 10% effect concentration (EC10). (B) EC10 values of adverse effects caused by the compounds across different test organisms.

Life Cycle Assessment (ULiège)

- Replacing PFAS based finishes significantly reduces impacts such as:
 - Climate change
 - Ozone depletion
- The results also highlight the importance of sustainably sourced renewable feedstocks, as biobased chemistry can increase pressure on land use.

Importantly, the extreme persistence of PFAS is not fully captured in standard LCA methods, reinforcing the strong justification for PFAS substitution from a long term toxicity perspective.



Towards a PFAS Free Textile Future!

PFAS FREE demonstrates that high performance, durable and sustainable water repellent textiles are achievable without fluorinated chemicals. By integrating chemical innovation, surface engineering and SSbD assessment, the project provides concrete solutions for a safer and more sustainable textile industry.

Project Partners

Coordinator: Centexbel

Partners: UCLouvain · Ghent University · ULiège



Contact us for more information on SSbD fluorine free water repellent finishes:

David De Smet: dds@centexbel.be

Pegah Zahedifar: pgz@centexbel.be

Funding

The PFAS FREE project is part of the National Recovery and Resilience Plan and is funded by the European Union.



**Funded by
the European Union**
NextGenerationEU

