



Reduced fluorine content oil and water repellent treatments for technical textiles

- Fluorocarbons are currently used to provide oil and water repellency for textiles in applications such as personal protection, sports ware and furniture.
- The use of such fluorocarbons is being restricted by the Environmental Protection Agency.
- The project objective is to provide alternative materials to replace these fluorocarbons, whilst maintaining repellency and durability.



Funded from the European Union's Seventh Framework Programme for research, technological development and demonstration.

Grant agreement no. GA315497



Research approaches:

1. Optimisation of commercially available products & process
2. Development of novel reduced fluorine content coatings
3. Development of fluorine free treatments





Optimisation of commercially available textile products & processes

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Scanning of COMMERCIAL FLUOROCARBON SYSTEMS:

- observed repellent effects are $C8 > C6 \gg C4$
- PFOS/PFOA legislation $\rightarrow < 1 \mu\text{g}/\text{m}^2$ ~~C8 FC~~



Tested BOOSTING METHODS for C6/C4 fluorocarbons:

- Macro level: waxes (paraffins / fatty acid esters)
- Micro/nano level (roughness): hydrophobic nano-silica; SMI/SMA nano-sponges; reactive β -cyclodextrins



ALTERNATIVE RESEARCH ROUTES:

- A. On chemical level: sol/gel based hydrophobic/oleophobic products (air curing /LAD features)
- B. On technological level: Nanofics (Europlasma) as vacuum plasma fluorocarbon nano-layer deposition

Application methodologies

+ padding + spraying + foam + kiss roll + digital

Future orientation profile



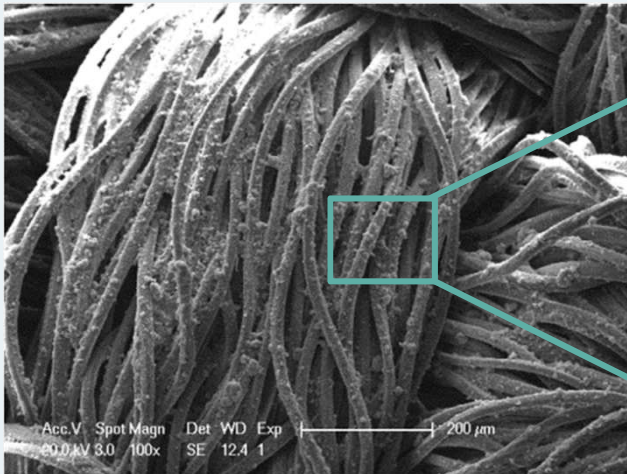
Development of Novel reduced fluorine content coatings



From superhydrophobicity...

Coating of a water based siloxane system with multi-scale silica

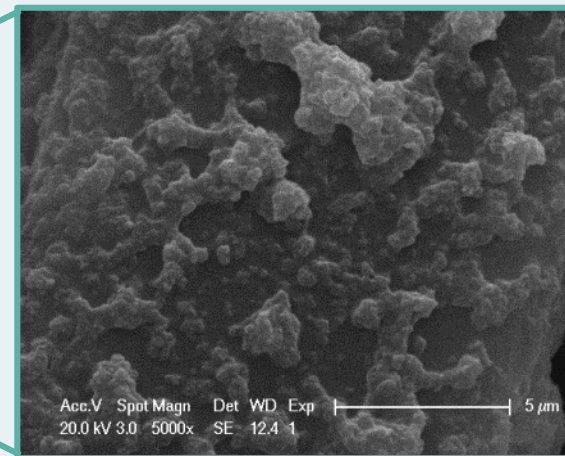
Superhydrophobic (contact angle $> 150^\circ$) and self-cleaning (sliding angle $< 10^\circ$) properties



To oleophobic textiles

Production of novel monomers with reduced fluorine content

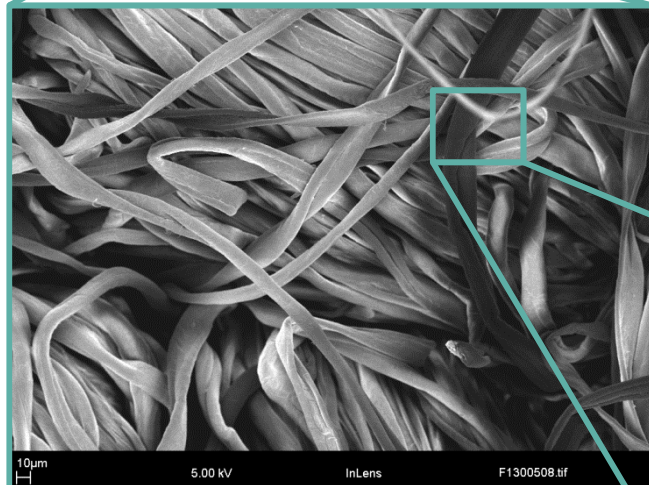
Post-functionalization of treated fabrics to increase their repellent behaviour and reach oleophobicity



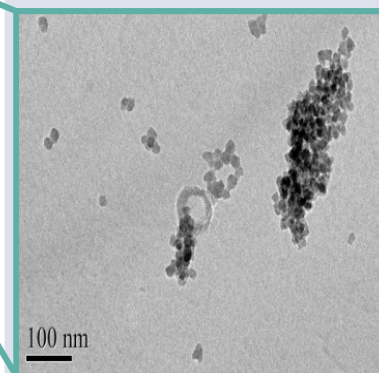
Application methodologies

Spraying or Padding or Kiss Roll

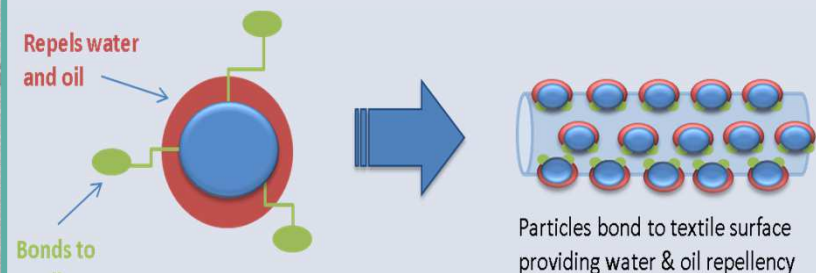
Development of Novel **fluorine free** and water based coatings



Development, synthesis and characterisation of novel fluorine free coating solutions based on multi-scaled nano-particles with high repellent functionality, bonded directly to the textile surface



Technical R&D principle





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