



TEXSHIELD: Environmental friendly and durable oil and water repellence finish on Technical Textiles

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State of the art

In the current market, the well-known brands of textiles are usually protected with perfluorocarbon chemistry to provide high durable oil and water repellent finish (OWR). The most common treatments are based on padding the fabrics with perfluorocarbons (PFCs) into the fabrics, due to their good water & oil repellence properties.

Unfortunately, the best performing PFCs, known as C8 also raise significant health and environmental concerns, by being very stable in the environment (bioaccumulative). Research has indicated that they are possible carcinogens and, consequently, PFCs-C8 are currently subject to high regulatory pressure.

Research ideas

• The main purpose of the TEXSHIELD project is to address the problems associated with textile protection by:

1. Eliminating problems with PFCs-C8 by the use of other products during finishing;
2. Providing cost-effective alternative treatments to PFC-C8 with durable water (and oil) repellency;
3. Reducing the total fluorine content in the treatment by means of new sol-gel derived additives in the form of nanoparticles or inorganic-organic hybrid networks;
4. Developing a durable and flexible solution for a broad range of textile substrates with a low ecological footprint, based on REACH-proof chemicals and taking in to account safety and health issues;
5. Demonstrating performance on a representative scale, with regards to key technical parameters including soil resistance, abrasion resistance, cleaning cycle resistance;
6. Providing a full Life Cycle Analysis (including washability cycle) and assessment of techno-economic benefits, via benchmarking against current products;
7. Providing the necessary technological transfer and training via SME associations to ensure awareness and take up throughout the EC

Scientific objectives

To generate a greater understanding of the relationship between new fluorosilicone water based hybrid emulsion textile treatment chemicals and their impregnation on textiles, in order to produce multifunctional, durable fabrics that are environmentally friendly without altering the feel of the fabric. A key aspect of the project will be to look at advancement of sol-gel solutions and development of materials to address performance requirements, specifically:

The identification of the optimum siloxane composition including all key functional groups, specifically:

- Chemical ligands to provide covalent bonding to a range of textiles
- Stable long-chain hydrocarbon groups to provide low surface energy
- Hydrophilic groups to enable water dispersion

The establishment of a fabrication methodology to allow the reproducible production of the siloxane building blocks.

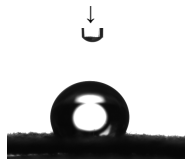
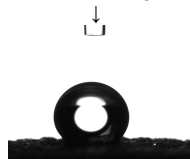
The production of a water-borne dispersion of the optimum siloxane composition.

The UV-curable systems integrating C6 or shorter chain chemistry applied in a waterborne formulation.

before washing

after 1 wash

after 5 washes



Technological objectives

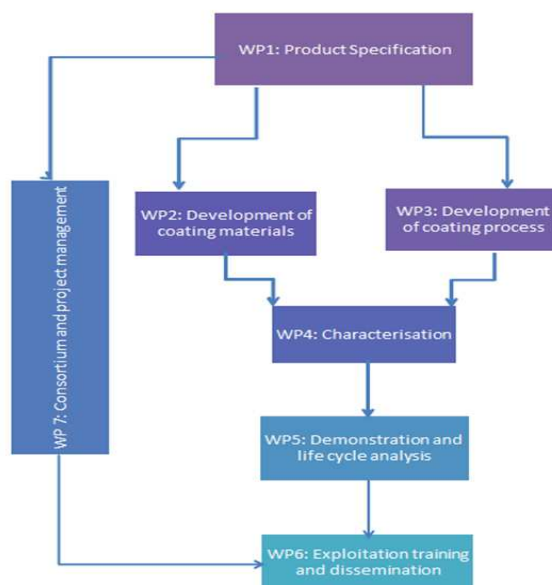
To develop molecular structures, which incorporate both low surface energy 22 (mN/m) properties and suitable binding groups, which will facilitate the chemical bonding to the fibre surface, yielding a high performance product. The specific objectives are to:

To develop anti-soiling treatments with fluorine content of less than 0.05% by weight on the final coated textile compared with 0.1-3.0% for the current state of the art, by the use of long chain hydrocarbon groups.

Develop anti-soiling treatments with high durability demonstrating no loss of performance after 50 washes, by the development of covalent bonding between the treatment and the textile.

To develop a water-borne coating that can be applied to textiles using standard immersion deposition techniques to produce a suitable layer on the surface of the fabric, without excessive loading, which would negatively alter the material properties (e.g. weight and stiffness).

To establish the techno-economic benefit of the treatment showing REACH compliance and environmental responsibility, whilst also achieving the cost base viewed as acceptable by the project partners.



Next steps

The SME-Associations (NWTEX - UK, UNITEX – BE, UPTEx - FR, Techtera - FR) within this European FP7-SME association project wish to ensure that the solution to the problem described above is made available for exploitation to their members. The approaches identified by the RTDs (TWI – UK, TO2C – BE, INSA - FR) likely to be in the direction of manufacture of nanomaterial solution derived by sol-gel method in- order to deliver the necessary performance attributes to the industry requirement. The developed know-how will be transferred appropriately to the industry. Following the project, the approach will be licensed to our interested members for exploitation.

References

1. www.texshield-project.eu
2. www.unitex.be
3. www.hogent.be