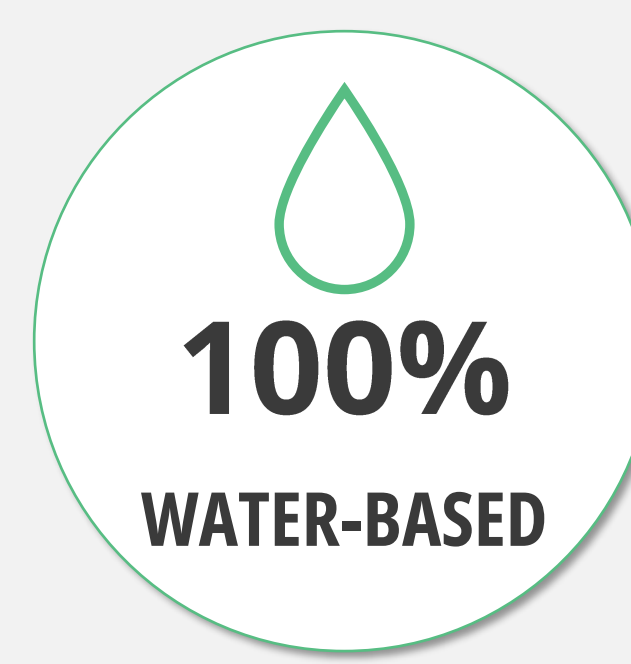


SSbD Guidelines

TEXTILE FINISHING



THE SYSTEM

APPLICATION

Finishing treatments for various textiles, including outdoor and performance apparel, home textiles (e.g., tablecloths and upholstery), and technical textiles.

FUNCTIONALITY

Achieving durable water and oil repellency with a surface tension between 10 and 20 mN/m, ensuring performance up to 10 washes, and maintaining soft touch, original color, and visual aspect of the fabric (e.g., polyester, cotton, or blends).

MATERIALS

Water-based hybrid sol-gel systems with high organic content to ensure flexibility on fabric substrate, functionalized fatty acids acting as hydrophobic precursors, and functionalized inorganic particles like CaCO_3 to create micro-roughness.

TARGET STAKEHOLDERS

Textile industry and finishers, outdoor and fashion brand owners, chemical formulators, and standardization and certification bodies (e.g., agencies involved in textile safety labels like OEKOTEX, and technical committees like CEN/TC 248).

KEY RISKS ADDRESSED

 HUMAN HEALTH Release of textile components; cytotoxicity risk	 ENVIRONMENT Leachates in washing water; harmful byproducts	 CIRCULARITY Durability failure after few washes; textile recycling	 PROCESS SAFETY High hazard class; flammability in curing ovens	 LCA & SOCIAL RISKS Consider social cycle and risks
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SSbD PRINCIPLES

Build safety and sustainability from the beginning.

 USE LOW-HAZARD SUBSTANCES	 AVOID PFAS & SVHCs	 USE BIO-BASED MATERIALS	 DESIGN FOR CIRCULARITY	 MINIMIZE EMISSIONS	 VALIDATE SAFETY EARLY
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ROADMAP

- 1 SCREEN SUBSTANCES**
Check CLP, REACH, QSAR & data-mining to assess hazards early.
- 2 SELECT SAFER MATERIALS**
Choose GPTES, bio-based linkers, and water-based systems.
- 3 ADAPT FORMULATION**
Optimize adhesion, fillers and curing for durability and comfort.
- 4 VALIDATE SAFETY & PERFORMANCE**
Test performance (contact angle, spray test), MTT assays.
- 5 ASSESS END-OF-LIFE**
Carry out LCA scenarios; ensure recycling compatibility.
- 6 SCALE-UP**
Pilot 20-50 L, validate on roll padder, optimize process.

RECOMMENDATIONS

 PFAS REPLACEMENT Use functionalized fatty acids (oleic, stearic) as hydrophobic precursors.	 LOW HAZARD CHEMISTRY Use GPTES instead of GPTMS to avoid methanol formation.
 ELIMINATE EMISSIONS 100% water-based systems reduce VOC exposure by 50%.	 DESIGN FOR DURABILITY Optimize adhesion promoters for ≥ 10 domestic washes.

INDUSTRIAL PROCESS

- 1 DIPPING-PADDING-ROLLING**
Impregnation and roll pressure to fix the coating
- 2 DRY**
Remove water content
- 3 CURING**
120-180°C (3-5 min)
- 4 QUALITY CHECK**
Uniform coverage, performance control

BIO-SUSHY RESULTS

Validated performance, safety, and circularity.

 Water repellency Surface tension 10-20 mN/m	 >130° Oil contact angle	 Up to 50% Bio-based content
 Up to 10 washes With hydrophobic properties	 Strong adhesion On polyester fibers	 No cytotoxicity Skin, lung, gut cells

LIMITATIONS

 Washing resistance vs. hydrophobicity Adhesion promoters may slightly reduce repellency.	 Water vs. oil repellency Meets oil contact angle $>130^\circ$ but not all ISO 14419 ratings yet.
 Soft touch vs. curing efficiency Lower temps for softness may reduce throughput.	 Single vs. double padding Double-padding improves durability but adds time & complexity.

