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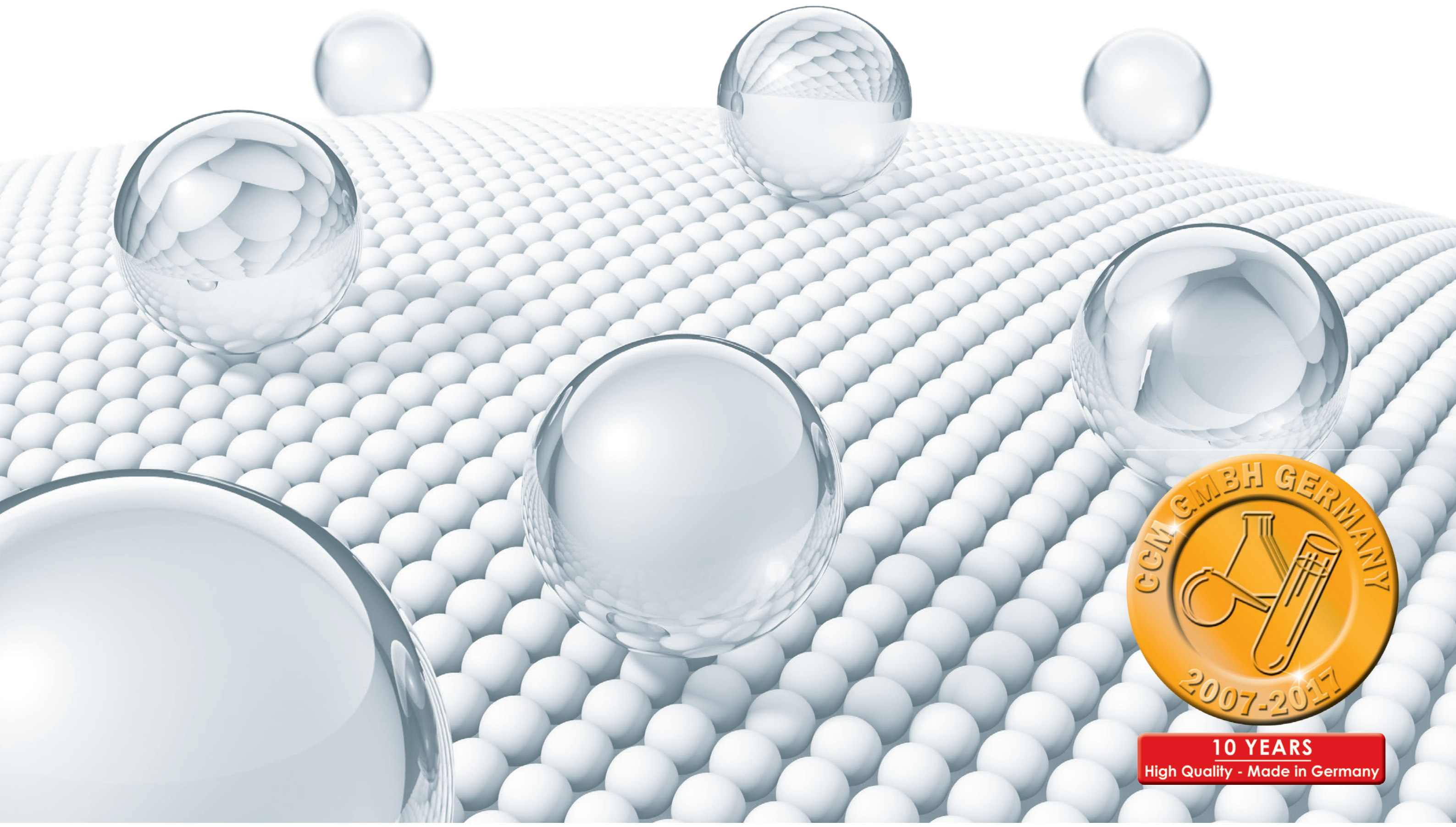
Hybrid Fluorinated Nano Silica Fusion Technology (HFNSF) with self-healing characteristics



Hybrid Fluorinated
Nano Silica Fusion Technology (HFNSF)
with self-healing characteristics

The Fabric Industry has been searching for a coating which offers the same performance as C8 (PFOA) technology, yet without the obvious negative attributes.
It became apparent that a technology based on SiO^2 could prove to offer the solution, and this has indeed proven to be the case.

The new Hybrid coating, which also utilises an environmentally optimised, slightly cationic, C6-carbonfluoropolymer, is PFOA-free, stunningly Hydrophobic and Oleophobic, Self Healing and most importantly Machine Washable.

Background:

C8 technology was identified as being profoundly persistent in the general environment and specifically within humans and as a result Greenpeace thankfully launched a campaign in order to ban the use of this technology; however, this campaign unfortunately also led to an unjustified demonization of all fluorinated technologies.

Fabrics coated with HFNSF technology after 15 wash cycles.

Perfluorooctanoic acid, also known as PFOA or C8, has been used in the manufacture of such prominent consumer goods as Teflon. It has been manufactured since the 1940s in industrial quantities. Despite offering outstanding performance characteristics, PFOA unfortunately also persists indefinitely in the environment and has been detected in the blood of more than 98% of the general US population. PFOA has been detected in, water, food, household dust and of course the human body. It has been used in the production of many items such as microwave popcorn bags, cookware, (PTFE / Teflon) cosmetics and carpet coatings.

Studies have concluded that there was probably an association between PFOA exposure and six health outcomes: kidney cancer, testicular cancer, ulcerative colitis, thyroid disease, hypercholesterolemia (high cholesterol), and pregnancy-induced hypertension.

As a result of these findings scientists around the world decided that a move towards C6 as a replacement technology may be appropriate.

Extensive testing has been carried out and C6 agents have been found to be safe: "*These compounds do not appear to possess the biopersistence and potent systemic and reproductive toxicity that are characteristic of C8-PFCs as a class. Instead, data from animal and epidemiological studies indicate that C6-PFCs are rapidly and completely excreted and do not appear to accumulate in biological fluids."

*Rice, P.A. Curr Envir Health Rpt (2015) 2: 33.
https://doi.org/10.1007/s40572-014-0039-3

Based on these findings it became apparent that an SiO^2 + C6 variant could form the platform for a new form of PFOA / PFOS free coating.

Fabric coating technologies available… until now:*

- long chain C8 = bio-magnification and bio-accumulation toxicity, prompted by UV light
- short chain C6 = UV prompts a degree of release into the environment - recognised as not being bio-accumulative - lower performance than C8; however, melding C6 with other technologies can enhance performance**
- short chain C4 = UV light prompts release. Poor general performance - weak oleophobicity, especially after washing.

*Technologies which do not offer effective oleophobicity were not considered. eg waxes and paraffin coatings

**Hybrid Fluorinated Nano Silica Fusion Technology offers a sustainable solution because the transmission of constituents (all of which are recognised as being non bio-accumulative) is significantly reduced, due to the exceptionally strong bonding structure of the matrix.

We are offering Outstanding Performance

CCM HFNSF technology provides an oleophobicity rating of 8 (ISO 14419)

This chart shows the performance of standard commercially applied fabric coatings. The maximum oleophobic rating after 10 washes is only 5.

DWR Chemistry	Water repellent PA after 10 washes	Water repellent PET after 10 washes	Oil repellent PA after 10 washes	Oil repellent PET after 10 washes
Fluoro C8 (telomer) (FC)	5	5	3,5	3,5
Fluoro C6 (telomer) (FC)	4	4,5	4,5	2,5
Fluoro C4 (EFC) (FC)	5	4	0	0

Note the significant drop in performance after washing. Due to the highly durable SiO^{2} component the performance levels of HFNSF coated fabric remains high, even after repeated washes.

We offer a technology which surpasses the performance of C8.

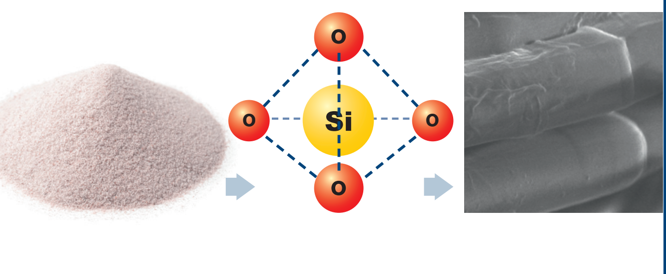
CCM Hybrid Fluorinated Nano Silica Fusion Technology (HFNSF) with self-healing characteristics.

Our experience of working with SiO^{2} based coatings informed us that this technology offered us the best foundation from which to create a new coating.The main obstacle to overcome was “enhancing the bonding characteristics of the coating”. This obstacle was overcome by creating a hybrid matrix, which, when heat cured would provide a coating which would not only match but supersede the performance characteristics of standard C8 fabric coating technology.

Attributes:

- PFOS and PFOA free
- F-C Modified silica. The fluorinated component is very strongly bonded to the SiO^{2}.
- Bonded structure massively reduces degradation of the coating.
- outstanding oleophobicity oil repellency 8, ISO 14419 (depending upon fabric type)

From Quartz Sand to a revolutionary Liquid Glass Technology Coating



The key component within our coating is nano scale silica

Technical Data:

- Washing stability 25-100 washing cycles
- (AATCC) Test Method 135, ECE formulation washing powder, non-phosphate reference
- Oil repellency: ISO 14419 / 8-6 (depending on the substrate), self-healing prompted by tumble drying
- Water repellency: AATCC 22 / 100, ISO 4920 / 5
- Temperature stability: 220°C
- Transparency: 100%
- outstanding UV-stability > 3.500 hours
- outstanding washing stability 25 to 100 cycles (self-healing)
- Good stability after chemical cleaning.

Industrial Application:

This coating is designed specifically for industrial application. The constituents are supplied in batch specific amounts. eg. clients will receive the constituents suitable for creating 1000L, 2000L, etc..

Simply mix the constituents into water to create the HFNSF coating.

Pre-drying at 100°C is recommended as the fabric must be dry before “curing”.

Curing 1 min. at 170°C-175°C for light/medium fabrics, 90 seconds for heavier fabrics.

Foulard application is recommended.

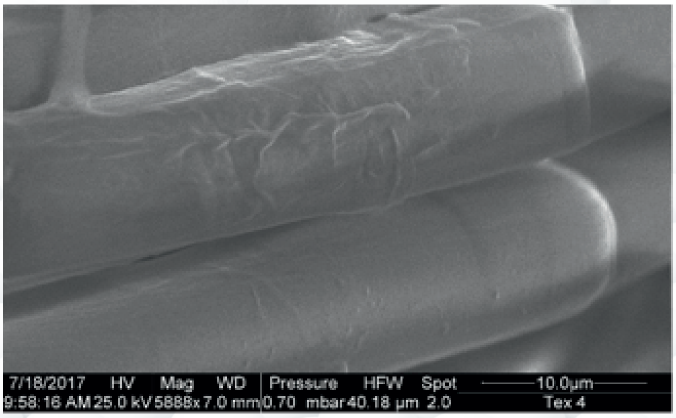
Stability of mixed coating: 2 days

Shelf life of the components: 1 year

Oil Repellency on fabrics (ISO 14419)

Type of textile	Results
Polyamid ISO 105-F03	oil 6 / 7 / (8-)
Polyester ISO 105-F04	oil 6 / 7
Wool ISO 105-F01	oil 6 (-) / 5
Cotton ISO 105-F09	oil 6 / 7
Multifiber ISO 105-F10	oil 6 / 7 / 8

REM Analysis



coating thickness between 300-900nm

Low Temperature Variant

We offer a variant which is designed for white fabrics which can „yellow“ at higher temperatures. This variant is also suitable for fabrics which will not withstand curing at 170°C-180°C. This low temperature variant should be cured at 150°C. This slightly more expensive variant offers almost identical performance to the standard coating.

Target Groups for Textiles

coated with Hybrid Fluorinated Nano Silica Fusion Technology (HFNSF) with self-healing characteristics:

- Military
- Hospitals
- Working Safety
- Sports Wear
- Adventure clothing
- Fashion clothing
- Upholstery
- Carpets

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