

Superhydrophobic Treatment Agent

FluoroThane TS

FluoroThane® TS is a 2-step, ~100 micron, air-dry, superhydrophobic treatment agent---FluoroThane TS A and FluoroThane TS B that is easily applied by spraying or rolling. When treated with FluoroThane, water forms beads and rolls-off the surface. This prevents water-film formation and reduces ice build-up.



Appearance and Performance:

The treated surface is frosty in appearance due to nanoparticles on the surface. Super-hydrophobic performance is retained under most conditions and for extended periods of time. This treatment is used for anti-wetting, anti-icing and anti- snow applications. It minimizes signal loss in Ku and Ka bands.

Durability:

FluoroThane repels rain, ice, and snow for 5~10 years. The FluoroThane treated surface may be washed with a hose spray, but handling or rubbing it, will reduce performance.

Coverage:

Apply by spraying or rolling. However, spray application provides the best appearance and most consistent results. Coverage will vary by thickness of treatment applied. Coverage of 500 ml (X2) of FluoroThane is approximately 10 square meters.

Directions:

The temperature of the surface to be sprayed should be between 45°F and 95°F. Keep containers at room temperature prior to use. All surfaces need to be dry and free from wax, grease, and polishes for good adhesion.

First shake the can of FluoroThane TS A vigorously for 30 seconds. The nanoparticles in the FluoroThane TS A must be dispersed properly before and during spraying. Hold the spray-gun vertically 8-10 inches from the surface. Depress the trigger button fully. Move the spray-gun evenly across the surface covering 6-10 inches per second. Apply half overlapping strokes 3-4 inches apart. Shake the spray-reservoir for a few seconds every 60 seconds. Allow the FluoroThane TS A to dry for 10 minutes or more before applying the FluoroThane TS B.

In the USA, the FluoroThane TS B is provided ready for spraying. For projects outside the continental United States, add acetone to the “dry-powder” FluoroThane TS B. Add 666 grams of acetone to 1000 ml bottles or 2636 grams of acetone to gallon cans and shake the container vigorously for 30 seconds. Hold the spray-gun vertically 8-10 inches from surface. Depress the button fully. Move the spray-gun evenly across the surface covering 6-10 inches per second. Apply half overlapping strokes 3-4 inches apart. Shake the spray-reservoir for a few seconds every 60 seconds.

Allow the treated surface to dry for over 24 hours before exposing to rain and will reach maximum durability after 5 days, so suggest testing after 5 days. For best long- term performance avoid touching the treated surface.

UV Light Resistance:

FluoroThane shows good resistance to solar radiation exposure (up to 1,000 Megajoules per square meter) that could be expected during 5 years in outdoor installations (please see data in Table 2 and 3). Surface analysis after prolonged exposure showed good resistance to damage, erosion, and water penetration.

Temperature Cycle Testing:

FluoroThane performs well in rapid temperature cycling tests (-45°F to 120°F 100X) and can be expected to perform well in both cold and hot environments.

Salt Fog and Chlorine Exposure:

FluoroThane is functionally uncompromised by the extremely corrosive chlorine atmosphere and can be expected to perform well in many other corrosive environments. FluoroThane showed complete or substantial resistance to high salt and high humidity environments that are expected for marine or coastal installations. No visible corrosion of metal substrate after 1,000 hours of salt fog was observed.

Performance:

FluoroThane exhibited no significant loss of contact angle after over 50 gallon per square inch of simulated heavy rain (please see table 3). In other tests, FluoroThane had 145° contact angles after exposure to extreme rain at 60 inches per hour for one hour. The treatment and substrate remain dry under 1 foot of water for one month.

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Substrates:

Recommended for plastic, treateded-surfaces, FRP, metal, glass, cereamic, stone, fabric, rubber, foam, and gelcoat.

Limitations:

Excessive abrasion will reduce performance. Organic solvents and oil exposure will reduce performance.



Purchasing and Shipping

FluoroThane samples are offered at www.CYTONIX.com, by emailing emailbox@cytonix.com or by calling 301-470-6267. The FluoroThane TS A is water-based and can be easily shipped worldwide. The FluoroThane TS B is shipped “dry” (solvent-free) and is also easy to ship.

Table 1: Summary specifications

Color	Frosty-white, Frosty-gray, Frosty-black, Frosty-red, Frosty-blue
Product codes	FluoroThane TS A, FluoroThane TS B
Solids percent	~30%, 100%
Flammable solvents	FluoroThane TS A: No, FluoroThane TS B: Yes
Water CA/Water FOA	150° ~165° / <0.7°
Storage temperature	20-30°C
Shelf life	1 year
Weatherability	Up to 5~10 years (environmental conditions dependent)
Dielectric constant	3 at 100 MHz
Electrical resistivity	~2 tera ohms
RF transparent	Very good
Rapid aging, UV and rain chamber; exposure time versus water contact angle	-- 1 year (7 days in chamber): 144° -- 5 years (25 days in chamber): 143° -- 10 years (48 days in chamber): 143°
Taber abrasion	Superhydrophobic after 10 cycles with CS10 wheel




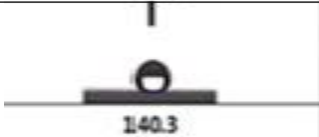
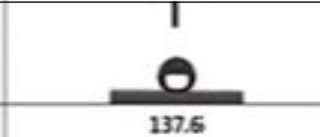

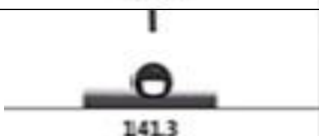
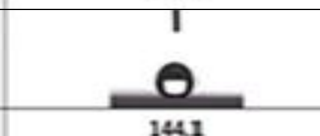

*CA contact angle FOA fall of angle

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Table 2: Solar radiation and water contact angle on plastic substrates treated with FluoroThane TS

Solar Radiation Megajoules per square meter [MJ/m ²]	Water contact angle on FluoroThane TS		Water contact angle substrate*
0	 130.8	 144.7	 75.5
300	 140.3	 137.6	 51.3
600	 141.3	 144.1	

*Testing over 600 MJ/m² was not carried out due to deterioration and failure of the substrate in this study

Table 3: Case study of heavy rain testing

Water Gallons / inch ²	Water (100 µl) roll-off angle after simulated rain exposure (degrees)									
	0	3	6	12	18	24	30	36	45	60
FluoroThane TS	1°	1°	1°	1.5°	1.5°	1.8°	1.8°	2°	2°	2.2°
FluoroThane ME	1°	1.5°	2.5°	3°	3°	3°	3.5°	4°	4°	5°
WX2100	1.5°	2°	2°	4°	6°	8°	8°	8°	8°	10°

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