FluoroSyl 880

FluoroSyl is a hydrophobic and oleophobic perfluoropolyether derivative. FluoroSyl provides long-lasting, anti-fouling, anti-fingerprint and anti-smudge properties to properly prepared surfaces. This produces a low surface energy, low refractive index, transparent, oil, water and stain repellent coating that is less than 10 nanometers thick.

Surface Preparation

FluoroSyl adheres to clean surfaces, such as glass, siliceous materials and metals. Materials rank ordered in adhesion from excellent to good include: Silica, Quartz, Glass, Aluminum, Copper, Tin, TiO2, Steel and Nickel. A clean surface that is free of interference from contaminants and coatings is needed for FluoroSyl adhesion. Use of oxygen or argon plasma to clean the surface of glass, plastic and metal produces the most durable coating. Alternatively, clean glass or metal with cerium oxide and water made into a paste using a swirling motion and rough cloth or paper towel. Then rinse with water and dry the substrate. Apply FluoroSyl immediately after surface preparation. The coating will be dry and tact-free in less than 5 minutes at room temperature. For curing, allow the devices to rest at room temperature for a few hours (or bake at 60-90°C for 15 minutes at 50% relative humidity). Using a soft cloth, wipe off any haze or cloudiness immediately after curing.

Coating Application

FluoroSyl may be applied using many methods including dipping, spraying, physical vapor deposition, spritz-and-wipe, etc. For Dipping, FluoroSyl may be diluted to 0.5% with water-free Isopropyl alcohol. Articles should be in solution for 1 minute. For spraying, we recommend air assisted atomization pressure of 5-10 psi (34-69kPa) and fluid pressure of 3-5psi (20-25kPa). For ultrasonic assisted atomization, use 30-45 kHz frequency and liquid air flow rates of 3/5ml per minute and an air shaping pressure of 30-60psi (206-413kPa). FluoroSyl may be applied by PVD after depositing onto heated boats or porous pellets. Spritz and spread-on FluoroSyl using a rubber squeegee can also be used.

Curing

The solvent evaporates and FluoroSyl dries in a few minutes producing a tact free substrate. However, FluoroSyl achieves its optimal properties with curing at 60 to 100°C for 15 minutes in a >50% relative humidity environment. Curing at room temperature would require between 1 to 12 hours to achieve proper adhesion. For the best abrasion resistance, we recommend curing at the highest substrate safe temperature possible.

Post-curing

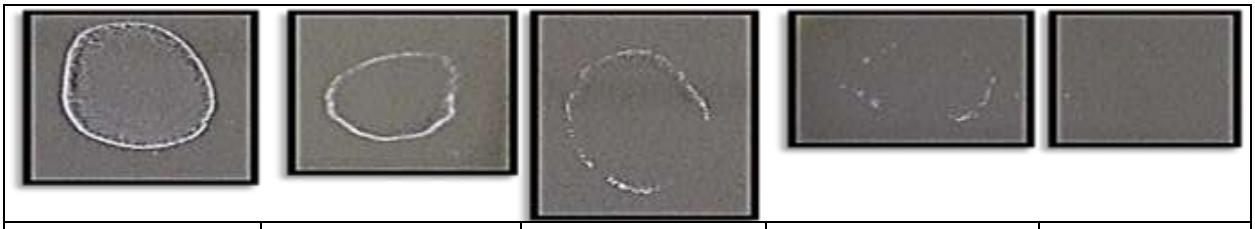
If the coated surface appears oily or hazy, wipe it with a clean non-abrasive cloth.

Testing Methods

Linear Abrader: The abrasion resistance was tested at 400 cycles with a soaked green felt, triple-folded 1 cm squared part with rubber a pad, 1.2 kg load, 2-inch stroke length, 30 cycles per minutes, turn every 100 cycles and replaced felt every 200 cycles.

Roll-off Angle: The goal was set at 20 degrees roll-off with DI water droplets of 75 microliters and rate of tilting stage of 1 degree per second.

Mineral Water Stain: The goal was set at a stain resistance level of #5. Gerolsteiner mineral water was used (75 microliters). Dry for 24 hours and wipe off with cotton swab. Rating of #1 to #5, with 5 being the best.



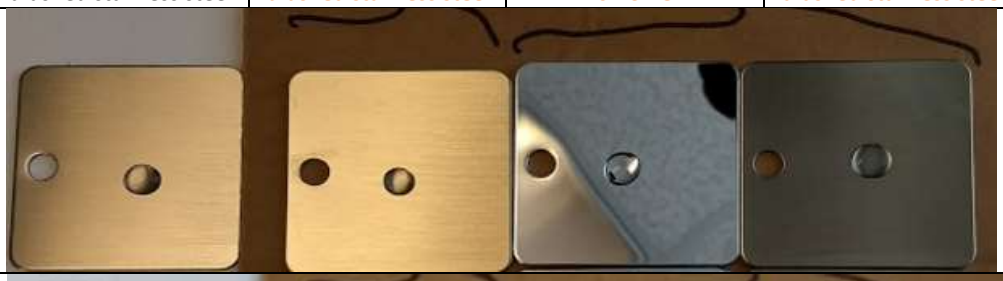
#1	#2	#3	#4	#5

Water contact angles: DI water droplets of 1.5 microliters Goniometer used for contact angle with a of achieving >90°.

	Material Finish	Water Roll-Off	Water contact angle with wear cycles				Date
			0 cycles	100 cycles	200 cycles	400 cycles	
Untreated control	Chrome	25°	65°	65°	65°	65°	170504
FluoroSyl	Chrome	24°	103°	101°	96°	91°	170504
Untreated control	Stainless	28°	69°	69°	69°	69°	170504
FluoroSyl	Stainless	30°	112°	113°	110°	108°	170504

	Material Finish	Stain Resistance (1-5) after cotton wipe after abrasion				Color Change	Date
		0 cycles	100 cycles	200 cycles	400 cycles		
Untreated control	Chrome	1	1	1	1	Reference	170504
FluoroSyl	Chrome	4	3	3	3	None	170504
Untreated control	Stainless	1	1	1	1	Reference	170504
FluoroSyl	Stainless	4	4	4	4	None	170504

8000 Virginia Manor Rd, #130
Beltsville, MD 20705, USA
www.cytonix.com
emailbox@cytonix.com
301.470.6267

	Uncoated control brushed stainless steel	FluoroSyl coated brushed stainless steel	FluoroSyl coated chrome	FluoroSyl coated brushed stainless steel
Water drop (75 µl) on plates				
Dried water stain on plates				

#1	#2	#3	#4	#5	#6

The figure shows 6 glass slides spray coated with black aerosol paint. The #1 glass slide cleaned and coated with FluoroSyl shows good paint repellency. The glass slides #2 to #5 are anti-graffiti coatings from competitors. The #6 slide is an "uncoated" glass slide showing good adhesion between paint and glass.

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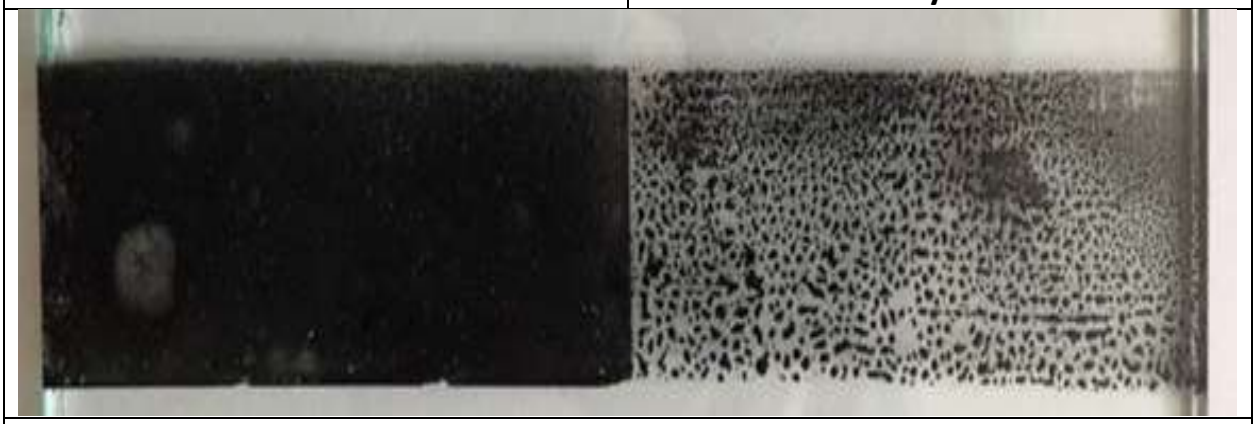
#1 Uncoated Reference	#2 FluoroSyl Coated



A piece of glass was divided into two and the #2 side was cleaned with a mix of 30% Cerium Oxide in water (cerium oxide is a common glass and metal sanding and rubbing compound). FluoroSyl at 0.2% in IPA was spritzed-on and evenly spread using a squeegee and allowed to cure overnight and then black spray painted. The #2 side is black spray paint/graffiti, sharpie, water and oil repellent. The #1 side is not paint, water and oil repellent.

Two pieces of polycarbonate were plasma treated to clean the surfaces. The cleaned polycarbonate was dip coated with FluoroSyl and air cured at room temperature for 60 minutes. The picture show 100 microliters of mineral oil on each of the pieces. The FluoroSyl coated piece is "repelling" the oil and the uncoated piece is "attracting' oil.

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A polycarbonate goggle was plasma treated to clean the surfaces. The cleaned polycarbonate was dip coated with FluoroSyl with a soak time of 60 seconds and cured at 93°C for 10 minutes with 50% relative humidity. The picture shows 50 microliters of mineral oil on two lenses. The FluoroSyl coated lens is “repelling” oil and the uncoated lens is “attracting’ oil.

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