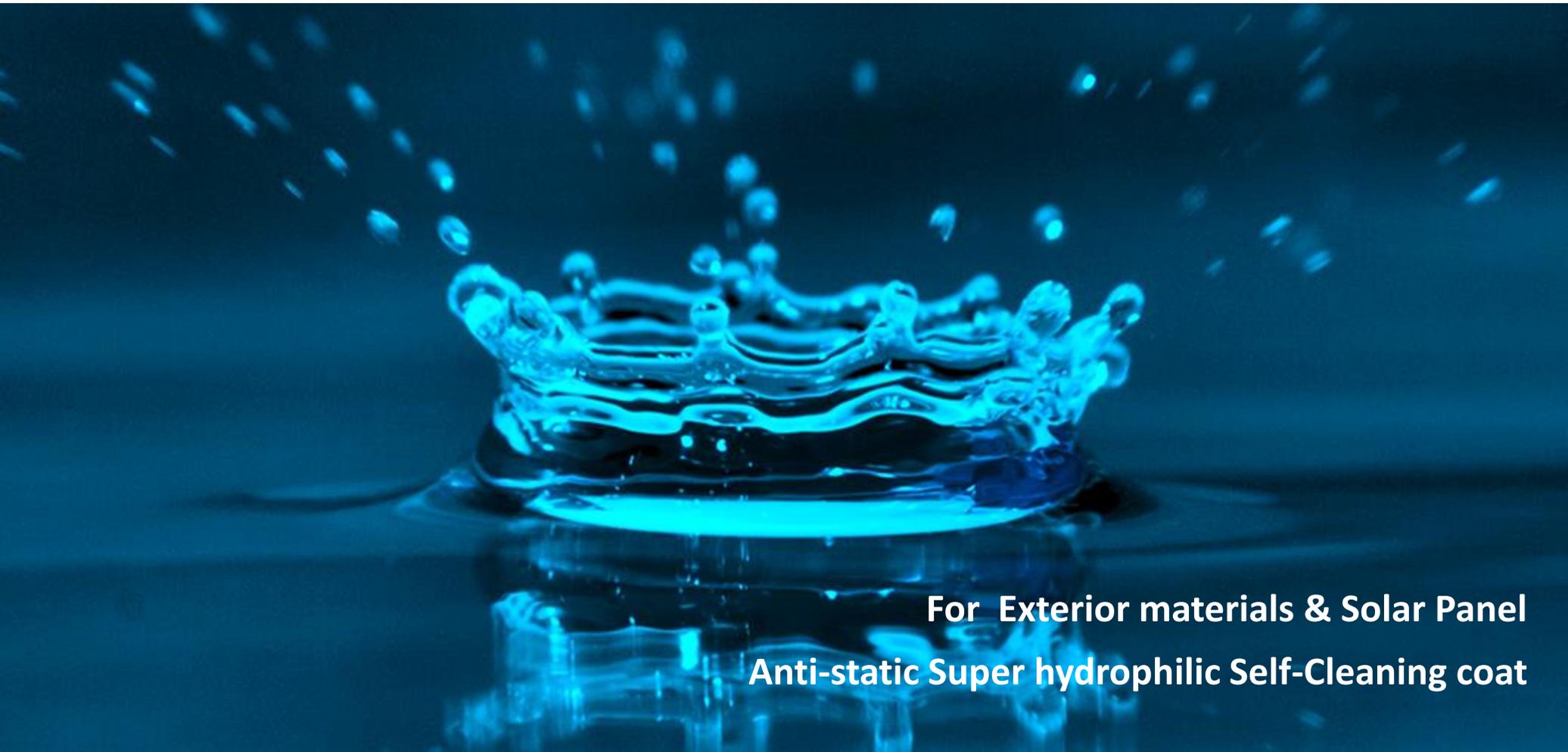


Nanotechnology solves dirt sticking problem.



For Exterior materials & Solar Panel
Anti-static Super hydrophilic Self-Cleaning coat

Anti-static and anti-fouling coating From fluorine photo catalyst to Anti static coating

Development the Super Hydrophilic Coating with Anti-static

To understand the anti-fouling problems of fluorine and photo catalyst solution which are used to major anti-fouling coating, we developed the new idea of anti-fouling in order to solve this problem.

We considered that the dirt does not adhere is important for anti-fouling coating, “Reduce the adhesion of dirt and easy to clean up” is our theme to develop new antifouling coating. Our antifouling coating, it prevents to adhere the inorganic dirt such as yellow sand and carbon with antistatic function as much as possible, and clean up the dirt with photo catalyst whether there is light or not. This product has 100% inorganic ,anti-static and super hydrophilic effect. Antifouling coating is suitable for the outer wall and materials, also on the painting.

The inorganic adhesion binder with tin oxide reduce the fouling of yellow sand and carbon in the antistatic effect. It does not mean to reduce the dust completely, but it could reduce the dust as much as possible like a clean room. Rather than porous as titanium oxide, silica SiO₂ can reduce the adhesion of dirt to form Nano-size a uniform uneven surface. The function of the inorganic adhesion binder, and Nano-sized irregular surface on fractal theory ✕ to form a permanent super hydrophilic film whether there is light or not. When it rains the water enter the Nano-sized uneven surface to take off the dirt. Eve cleaning becomes easy.

✕Fractal theory

Effect of the hydrophilic can be improved by fine unevenness of the surface.

Unevenness lines uniform becomes a super water-repellent status;

on the other hand, it lines unevenly becomes super-hydrophilic status



100% Inorganic

The demand for anti-fouling coating

Various causes of pollutants and dirt in the air

The main contaminants of the exterior window panes are the combination of dust, yellow sand, carbon from the exhaust gas, pollen, soot and so on.

The window panes should not get fouled the dust easily, and require as few cleaning as possible. At the window panes for high-rise buildings where daily cleaning is not possible, The self-cleaning function by the rain is the most required factor. The necessity for as few cleanings as possible is even more important, since cleaning cost of high-rise building is very costly.

In China, Southeast Asia and Middle East countries, there are many buildings with glass walls. As the labor cost is expected to rise in the near future, by applying anti-static and anti-fouling coating while the labor cost is relatively inexpensive. The cost of cleaning and maintenance in the future will be reduced greatly.



What is the cause of fouling?

Causes of dirt	Solutions	Function/Performance
Dust, iron powder, oxide	Anti-Static	Suppress adhesion of inorganic stains and organic stains that cannot be decomposed
Carbon, coal ash, smoke, exhaust gas		
Pollen, sap, oil stains	Super-Hydrophilic	Make it easy to remove dirt that adheres and is difficult to remove with rainwater
Animal droppings, carcasses of insects	Chemical resistance, hard coat property	Strongly to strong acid and alkali, a hard coat, and easy to clean.
NOX, SOX, Acid rain, Degradation due to chemical change		
Deterioration fading , shape deterioration due to ultraviolet rays	100% inorganic film	100% inorganic coating suppresses deterioration
Stain caused by mold		
Degradation and fading due to heat and oxidation		

Requirement for Anti-fouling coating?

- Reduce the adhesion of dirt, also easy to fall attached dirt
- When compared to the cost of cleaning, there is a merit of cost
- High-transparent and does not impair the texture of the base material
- Inorganic 100%, there is a chemical resistance, excellent durability and environmental resistance

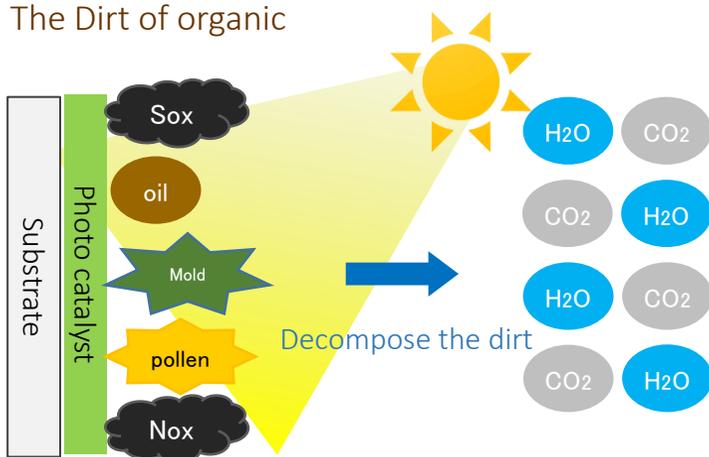
Compare to other products

The Problem of a photo catalyst coating

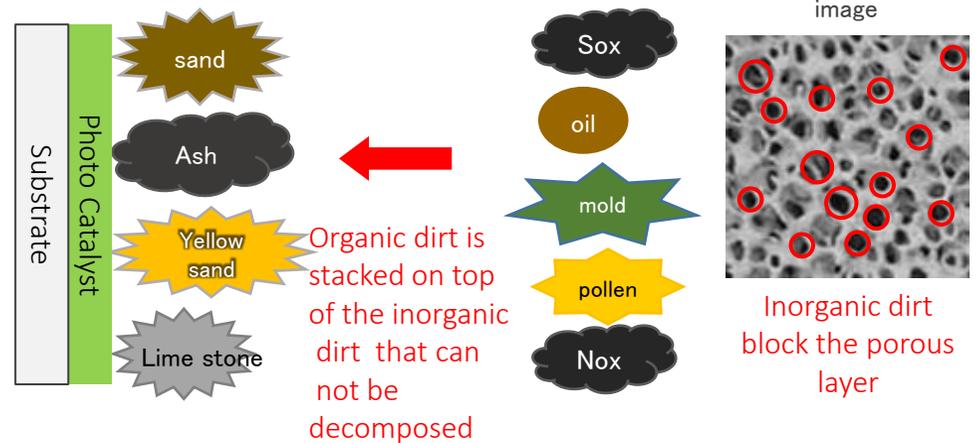
Photo catalytic antifouling coat effects the dirt of organic gathered on the surface of the porous decomposed by ultraviolet rays. Also, drop the dirt in the rain water by hydrophilic function. China and Southeast Asia is the dirt of inorganic sand and carbon.

Photo catalyst coating decomposes dirt of organic, but it can not decompose the dirt of inorganic. So, it will dirty more by collecting dirt on the surface of the porous. In addition, decomposition and the hydrophilic function of the organic matter in the ultraviolet light can not be exhibited.

The Dirt of organic



The Dirt of inorganic



Issues of other products

Issues of fluorine coat

Fluorine-based antifouling Coating has been used, it is an issue that antifouling effect does not perform as it expected although it is expensive.

Fluorine-based coating has an excellent chemical resistance, good weather resistance, and environmental resistance, there is a feature to be easy to clean the attached dirt. But, it does not has a function to reduce the adhesion of dirt.

It is charged and can not be suppressed the adhesion of dirt, because the coat surface becomes water repellent, and stand out the dirt of a drop water and rain dripping mark.

In addition, the fluorine-based coating is weak to ultraviolet light because of organic material, and aging degradation.



Function of Anti-Static & Super Hydrophilic Self Cleaning Coat

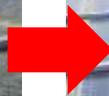
Reduce the dust as much as possible with antistatic effect!!

What is anti-static?

When the surface of the substrate is charged (Charged electrostatically), and then electric is sticking with other materials and particles, such as dirt, dust and sand in the air.

Antistatic is easy to flow electricity to reduce the volume resistivity.

Since the anti-static material is discharged into the air and can be reduced to accumulate static electricity, it is possible to suppress the adhesion of dirt, dust and sand caused by static electricity or the like.



suppress the adhesion of dirt

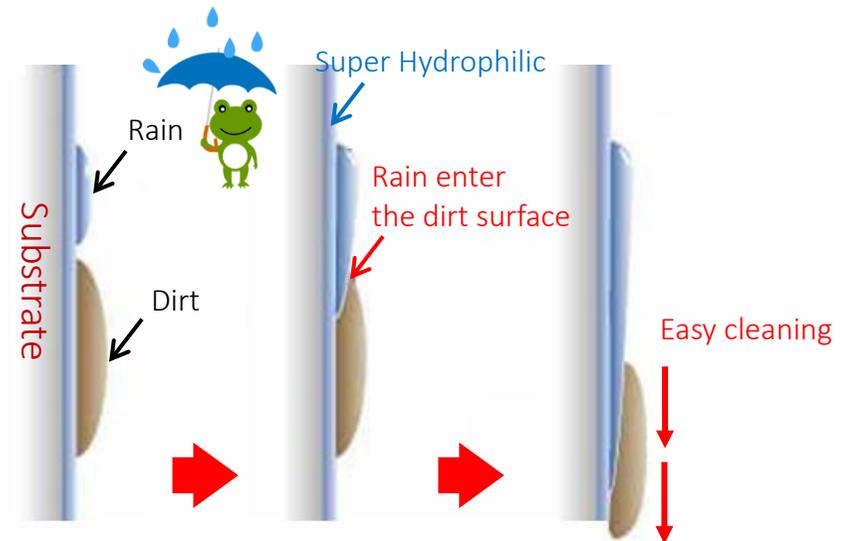
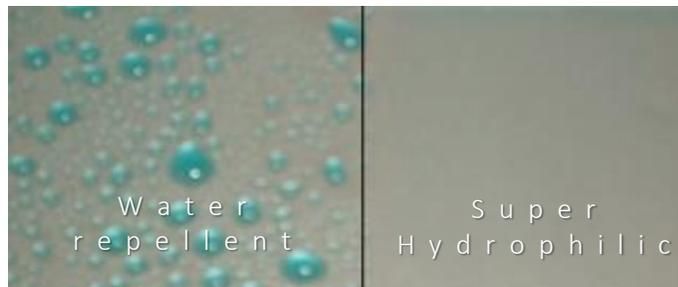
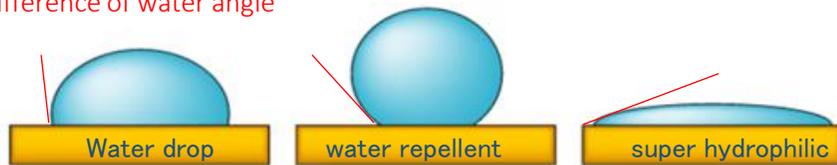
Function of Anti-Static & Super Hydrophilic Self Cleaning Coat (2)

Wash away the dirt in the rain water with super-hydrophilic effect

Super hydrophilic means less than 10 degree of water angle to the substrate.

Water droplets remain as they are on the untreated surface, But they will seep into the layer under the fouling on the hydrophilic surface, thus removing it. The water-repellent surface only repels the water, and has no function to clean itself.

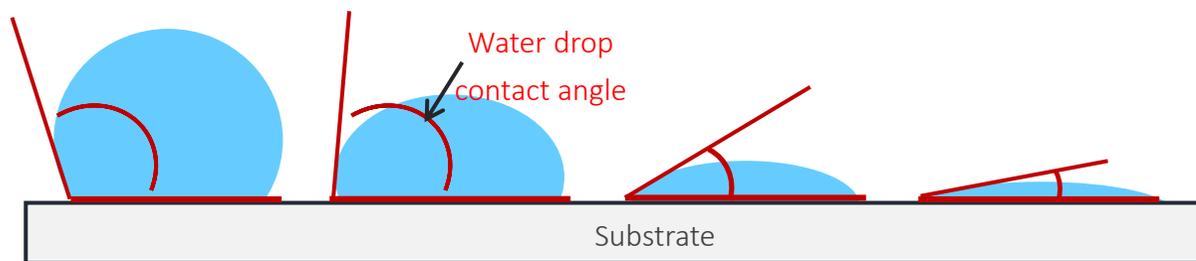
Difference of water angle



Which can keep the clean Water-repellent or Super hydrophilic coating?

Water drop contact angle

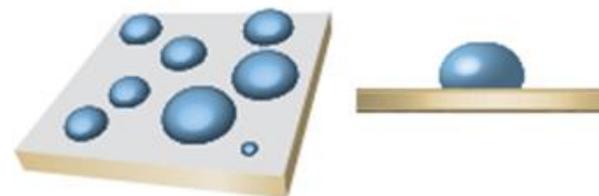
When Water drop contact angle is small, the dirt is easy to take off.



Super water-repellent 110~180° Water repellent 70~100° Hydrophilic less than 40° Super hydrophilic less than 10°

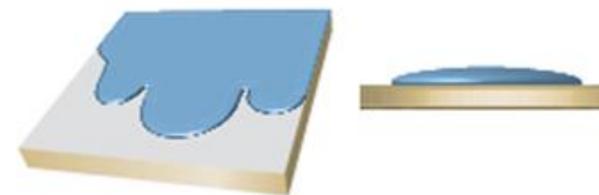
Painting	Water drop angle(°)	Dirtiness by water drop angle
Teflon	110~115	Easy to take off the dirt
Fluorine resin paint	100~105	Easy to adhere the dirt
Silicone paint	100~105	Easy to adhere the dirt
Acrylic urethane paint	85	Easy to adhere the dirt
NOF Bell clean paint	30~40	Difficult to adhere the dirt
Titanium oxide coating	~10~	Photo catalyst/Super hydrophilic
SUPER GLASS BARRIER	Less than 3~5	Antistatic/Super hydrophilic

Water-repellent:
Water is rolling on the dirt.



Exterior material of the water-repellent: general organic coating film, etc.

Hydrophilic: water is spread on a flat
Water enters the bottom of the dirt



Hydrophilic exterior materials: tile, stone, etc.

Super Hydrophilic Performance

Super Hydrophilic

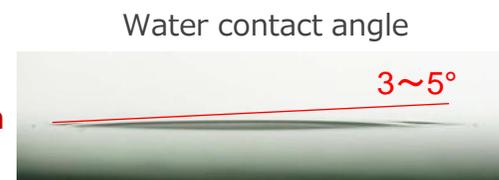
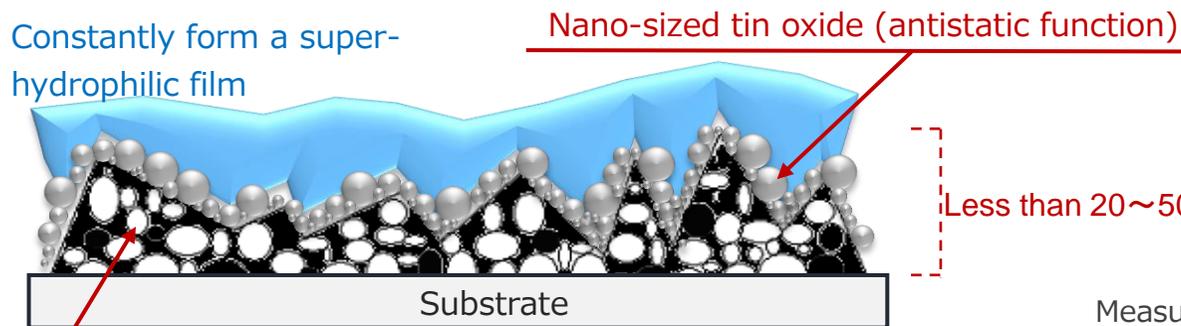
Creating an even on the surface of the glass by using 100 to 200 Nano-sized silica, unlike the super-hydrophilic effect of the photo catalyst, it can make a constantly super-hydrophilic film without the irradiation of light. Contact angle is 5 degrees or less , so the rain or water enters the bottom of the dirt and it washes away the dirt.

✕Fractal theory

Effect of the hydrophilic can be improved by fine unevenness of the surface.

Unevenness lines uniform becomes a super water-repellent status;

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Measurement: High Environmental Engineering Co.,Ltd

Make the unevenness in 2 ~ 15nm of silica (inorganic 100% of the adhesion binder)

Inorganic 100% adhesion binder technology of super glass barrier is the world's highest level.

4 type of products

1、Super Glass Barrier (SGB)·· for Painting wall, aluminum panel, tile, concrete, bricks, stone

Ingredient ①SiO₂(Silica)··Super-hydrophilic & Adhesive binder
②SnO₂(Tin Oxide)···Anti-Static
③Methanol

Since the antistatic material=tin oxide is used, the surface resistance value for measuring the antistatic performance becomes 10⁸ Ω, and the stain prevention effect is high. Also, because of high adhesion performance and high transparency, it is possible to apply without changing the texture of the base material and it can be applied without curing.

2、Solar Self Maintenance Coat CNT···· for Solar Panel surface

Ingredient ①SiO₂(Silica)··Super-hydrophilic & Adhesive binder
②SnO₂(Tin Oxide)···Anti-Static
③CNT(Single Walled Carbon Nano tube)·· Enhanced antistatic, hard coating, chemical resistance
④APT (Tungsten oxide)···Photocatalyst
⑤Methanol and Distilled Water

For Solar Panel, in addition to antistatic use CNT, photocatalyst APT. CNT has Greatly improved antistatic function, improved chemical resistance, weather resistance, adhesion, and wear resistance. APT is photocatalyst nano material which does not require light. This nano-tungsten is the world's smallest class of tungsten particles with a particle size of 5 to 10 nm compared to the conventional particle size of 20 to 40 nm. Nanoparticles with extremely high surface area per unit deposition maximize catalytic effectiveness.

3、Solar AR Maintenance Re-Coat·· for Solar Panel surface

Ingredient ①SiO₂(Silica)··Super-hydrophilic & Adhesive binder
②SnO₂(Tin Oxide)···Anti-Static
③APT (Tungsten oxide)···Photocatalyst
④Pt (Platinum) ···Chemical resistance & total performance up
⑤Methanol and Distilled Water

For Solar panel, In addition to antistatic use, photocatalyst APT which decomposes organic contamination such as pollen and resin emerging from trees is used. However, APT not reducing the transmittance of the solar panel is used, and platinum is also used as the low reflecting material. It is also ideal for solar panel that can not perform periodic cleaning.

4、Resin Primer·· for resin material such as acrylic board, PC plate and so on

Ingredient ①SiO₂(Silica)··Super-hydrophilic & Adhesive binder
②SnO₂(Tin Oxide)···Anti-Static
③Methanol and Distilled Water

Physical properties

Test	Description	Result
Weathering test	Super UV / 300H	More than 10years
Water drop contact angle	Sessile drop method	Less than 5°
Adhesion	Boiling aqueous test/ 1H	10 years
Pencil hardness	Change by the hardness of the base material	4H~9H
Adhesiveness	Foundation tape method	100/100
Adhesion and moisture resistance	Steam test / 1H	Not problem
Chemical resistance	Hydrochloric acid 5% / 5min	Not problem
	Caustic soda 5% / 5min	Not problem
Surface resistance value	Super Glass Barrier	$10^{8\Omega} \sim 10^{9\Omega}$
Visible light transmittance		90%~92%
Heat-resistant	200°C / 1H	Not problem
Cool weather resistance	-18°C~20°C	Not problem