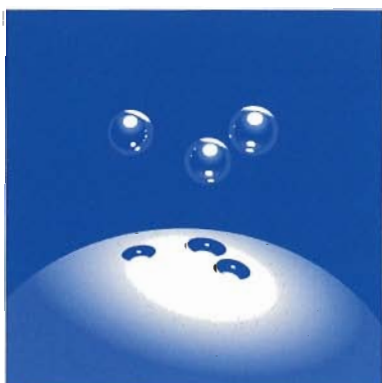


AGSI
Asahi Glass SI-Tech

Functional scaly silica filler

SUNLOVELY[®]



*We have endeavored as an
pionner of silica
chemistry for half a century.
We are creating the future chemistry
with limitless possibility involved.*

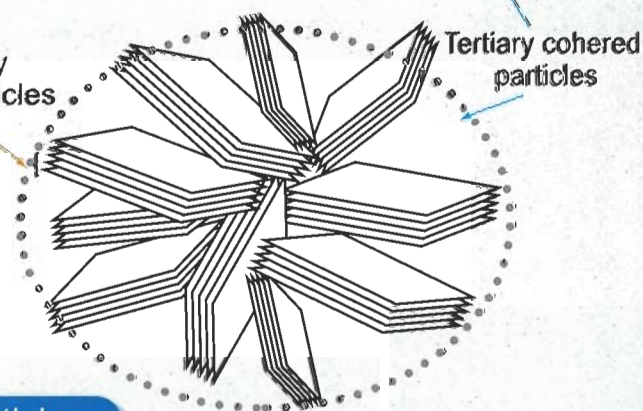
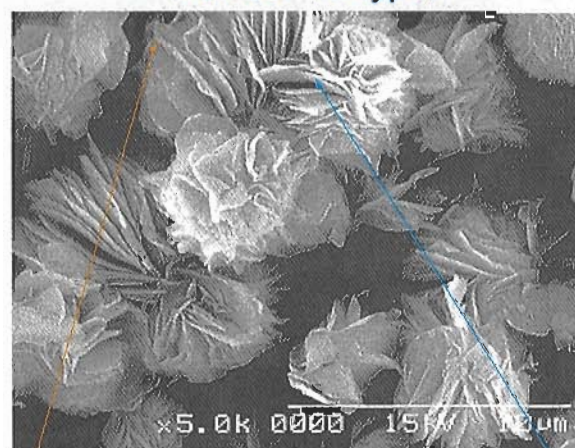
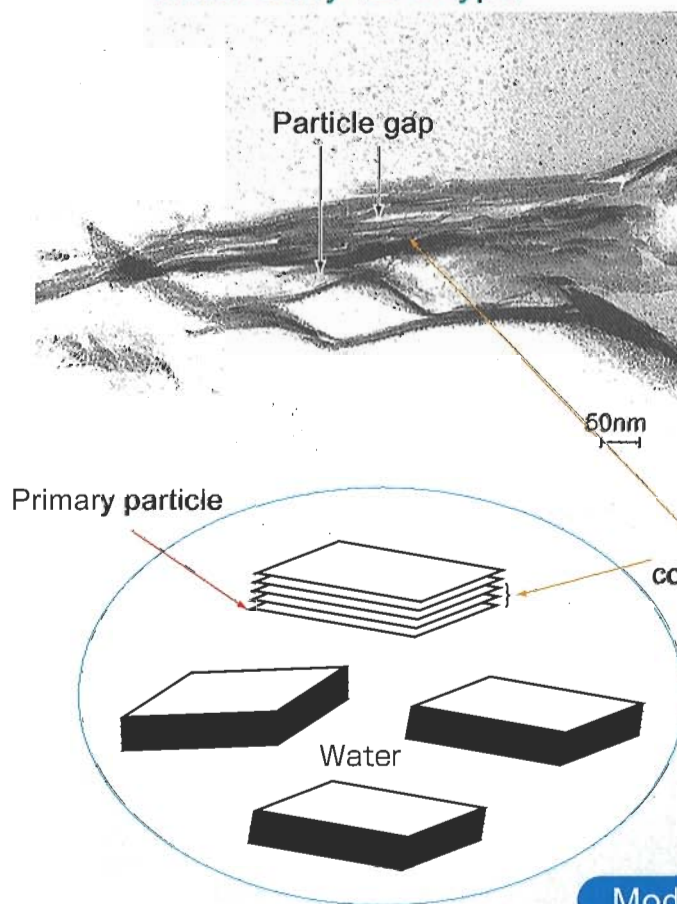
Functional scaly silica filler

SUNLOVELY®

SUNLOVELY consists of new functional fine particles that are microscopic secondary particles formed by nano-sized ultra-thin (scaly) silicon dioxide (SiO_2) fine particles (primary particles) overlapping in parallel or tertiary particles formed by three-way cohesion of the secondary particles. SUNLOVELY is available in two types, powder and slurry dispersed in water. You can select the optimum properties for your purpose.

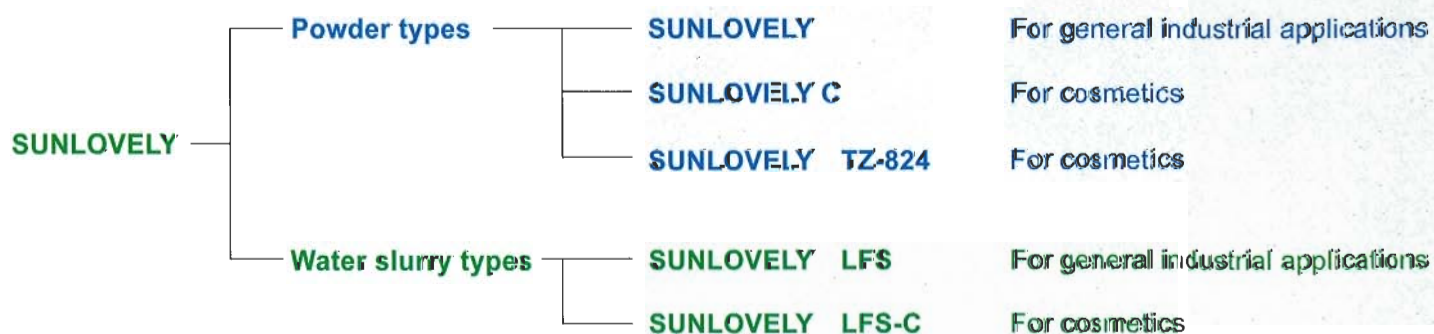
Water slurry (LFS type)

Powder (C type)



Models of particles

Product lineup



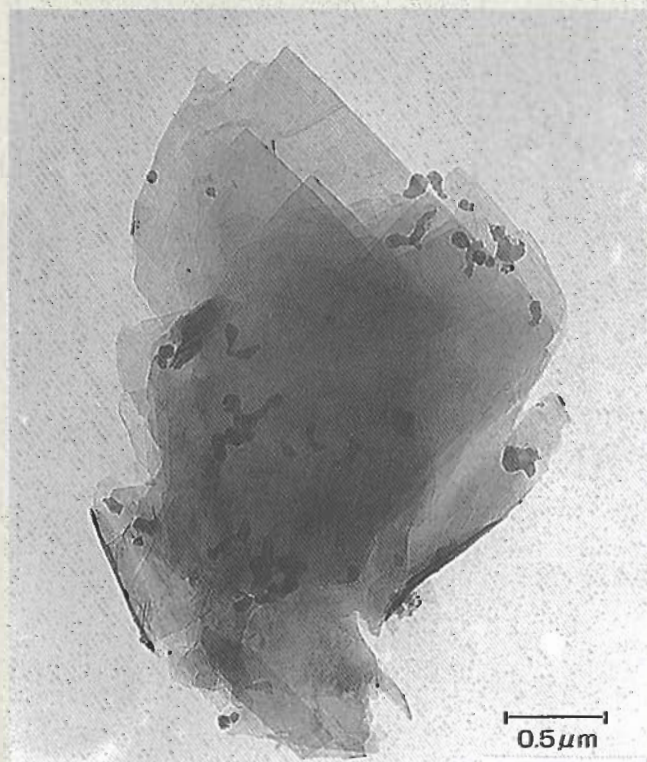
Functional scaly silica

SUNLOVELY[®]C

SUNLOVELY C is a new functional fine powder material consisting of tertiary particles formed by three-dimensional cohesion of scaly silicon dioxide (SiO_2) fine particles. The particles are shaped like rose petals. They can effectively and uniformly disperse and support various functional materials on their surfaces or in their cavities.

Features

- SUNLOVELY C is white fine powder consisting of at least 99.0% silicon dioxide (SiO_2) is an odorless compound with a high chemical stability.
- The primary particles are non-porous scaly particles in the form of a maximum thickness of $0.1 \mu\text{m}$ and have remarkably high transparency and adhesion.
- Since the particles have a large specific surface (50 to $80 \text{ m}^2/\text{g}$) and gaps (0.1 to 0.15 cc/g) in themselves, they can bind various functional fine particles (UV protection agents, pigments, fragrances and various effective ingredients) to their surfaces and in their spaces (intervals) to effectively, easily and uniformly disperse and support these functional particles.
- The irregularly overlapping secondary particles that can diffuse light provide a softer light effect than spherical porous silica particles.



TEM photograph



SEM photograph

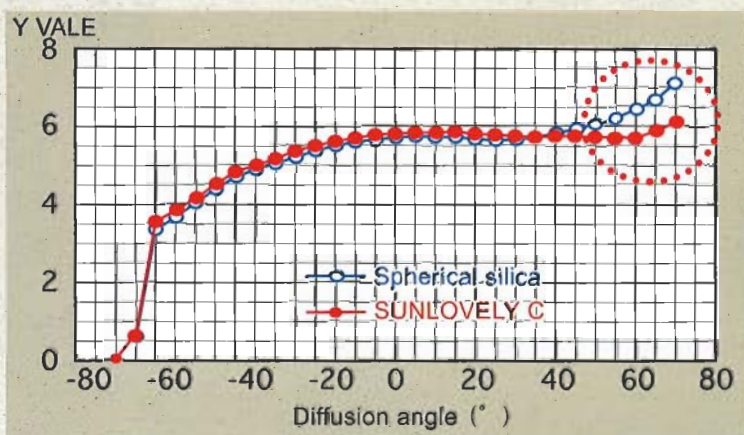
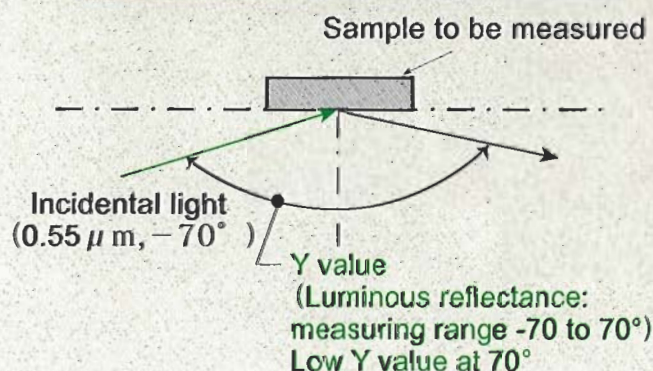
Specifications

Properties	Specification	Measuring method
Appearance	White odorless and tasteless particles	Organoleptic examination
Identification test	White gel precipitate occurs. Precipitate is insoluble in diluted hydrochloric acid.	Silicic anhydride identification test (1) specified in Japanese Standards for Cosmetic Ingredients
(1) Precipitation test		
(2) Color test	Precipitate is blue.	Silicic anhydride identification test (2) specified in Japanese Standards for Cosmetic Ingredients
Purity test		
(1) Water soluble content	2.0% maximum	Silicic anhydride identification test (1) specified in Japanese Standards for Cosmetic Ingredients
(2) Heavy metals	30 ppm maximum	Silicic anhydride identification test (2) specified in Japanese Standards for Cosmetic Ingredients
(3) Arsenic	5 ppm maximum	Silicic anhydride identification test (3) specified in Japanese Standards for Cosmetic Ingredients
(4) Fluorine	30 ppm maximum	Silicic anhydride identification test (4) specified in Japanese Standards for Cosmetic Ingredients
Quantitative determination	99.0% minimum	Silicic anhydride determination method specified in Japanese Standards for Cosmetic Ingredients
Loss on drying	3.0% maximum	Japanese Standards for Cosmetic Ingredients (1g, 105°C, 2hrs.)
Ignition loss	7.0% maximum	Japanese Standards for Cosmetic Ingredients (1g, 850°C, 0.5hr.)
Mean particle diameter	4.0 to 6.0 μm	Coulter counter
Oil absorption capacity	80 to 110 ml/100g	JIS K5101
pH	6.0 to 8.0	(10% water slurry)

Possible applications

- SUNLOVELY increases the strength and durability of pressed products.
- Since it excels in adhesion, coating performance and moisture retention, it is suitable for improving the functionality and texture of cosmetics.
- When added to cleaning agents, it improves the quality of suds.
- Used to disperse and support functional fine particle ingredients (UV shielding agents and pigments).
- When impregnated with fragrances and various effective ingredients, it can control the rate of volatilization (sustained release).
- When added to cosmetics, it provides them with soft-focusing performance and matte texture.

Diffused-light effect by SUNLOVELY C



Functional scaly silica

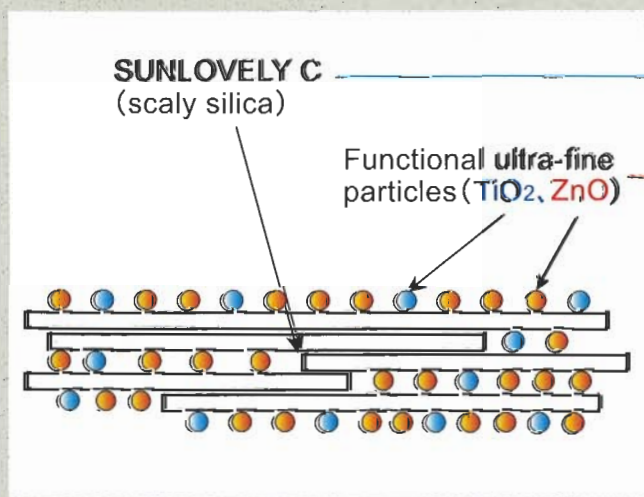
SUNLOVELY[®] TZ-824

SUNLOVELY TZ-824 is a new functional powder material consisting of fine particles of UV shielding agent highly dispersed and supported by SUNLOVELY C. This material has a high UV shielding effect.

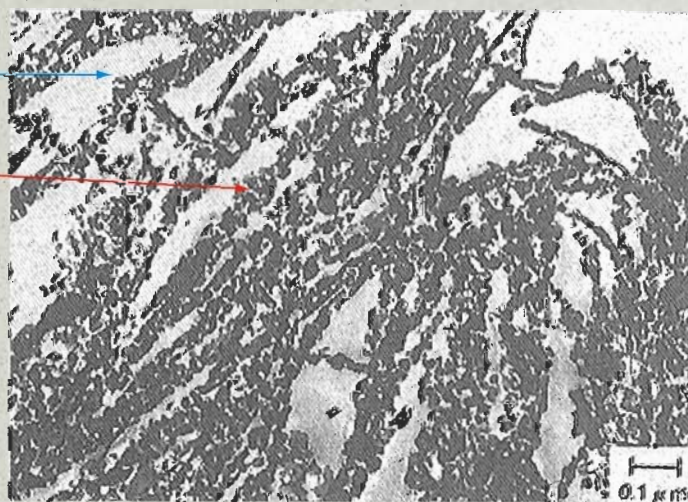
Features

- This powder material is obtained by dispersing and supporting 8% of ultra-fine titanium oxide particles having a mean particle diameter of 0.01 to 0.03 μm and 24% of ultra-fine zinc oxide particles having a mean particle diameter of 0.03 μm in the gaps in the scaly particles of SUNLOVELY C.
- This material is an odorless and chemically stable compound in fine white powder.
- It effectively shields against UV-A and UV-B rays.
- When blended with cosmetic powder, it is not affected by vehicles and maintains uniform dispersion and support.
- It reduces the catalytic activity of supported fine metallic oxides.
- Like SUNLOVELY C, it has an excellent diffused light effect.
- It has moderate spreadability and adhesion.

Shape



Model of SUNLOVELY TZ-824



TEM photograph of TZ-824

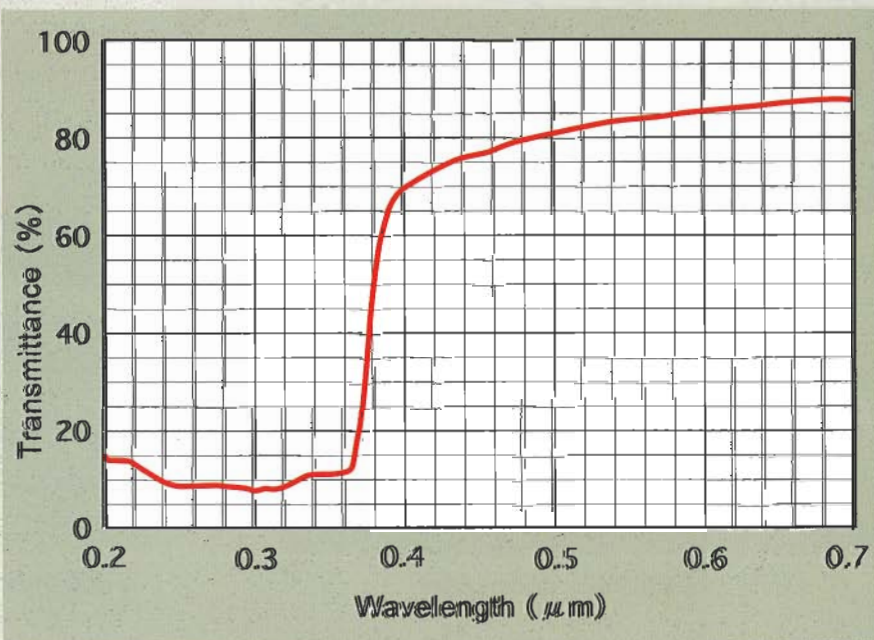
Specifications

Properties	Specification	Measuring method
Organoleptic examination	White odorless and tasteless powder	Organoleptic examination
Identification test	White gel precipitate occurs. Precipitate is insoluble in diluted hydrochloric acid.	Silicic anhydride identification test (1) specified in the Japanese Standards for Cosmetic Ingredients
(1) Precipitation test		
(2) Color test	Precipitate is blue.	Silicic anhydride identification test (2) specified in the Japanese Standards for Cosmetic Ingredients
Purity test	2.0% maximum	Silicic anhydride identification test (1) specified in the Japanese Standards for Cosmetic Ingredients
(1) Water soluble content		
(2) Heavy metals	30 ppm maximum	Silicic anhydride identification test (2) specified in the Japanese Standards for Cosmetic Ingredients
(3) Arsenic	5 ppm maximum	Silicic anhydride identification test (3) specified in the Japanese Standards for Cosmetic Ingredients
(4) Fluorine	30 ppm maximum	Silicic anhydride identification test (4) specified in the Japanese Standards for Cosmetic Ingredients
Quantitative determination of SiO_2	63.0 to 73.0%	Silicic anhydride determination method specified in the Japanese Standards for Cosmetic Ingredients
Quantitative determination of ZnO	20.0 to 28.0%	Chelatometry
Quantitative determination of TiO_2	5.0 to 11.0%	Chelatometry
Loss on drying	3.0% maximum	Japanese Standards for Cosmetic Ingredients (1g, 105°C, 2hrs.)
Ignition loss	7.0% maximum	Japanese Standards for Cosmetic Ingredients (1g, 850°C, 0.5hr.)
Mean particle diameter	4.0 to 6.0 μm	Coulter counter
Oil absorption capacity	50 to 90 ml/100g	JIS K5101
pH	6.0 to 8.0	(10% water slurry)

Spectral properties of TZ-824 (UV shielding properties)

Measuring method

1.12 g of Vaseline and 0.48 g of liquid paraffin were added to 0.4 g of the powder to be measured. The mixture was kneaded with three rollers to sufficiently disperse the powder. The obtained paste was pressed between quartz plates 2 mm in thickness until it spread to a thickness of 25 μm . The transmittance was measured by using a self-recording spectrophotometer.



Functional scaly silica

SUNLOVELY[®]LFS-C

SUNLOVELY LFS-C is a new functional fine particle water slurry in which scaly parallel with overlapping (two-way) secondary particles of silicon dioxide (SiO_2) are dispersed in water. This material has an inherent film forming ability and improve the adhesion to the skin, moisture retention and resistance that help makeup last.

Features

This material is water slurry in which scaly secondary particles of silicon dioxide (SiO_2) overlapping in parallel (two-way) are dispersed in water.

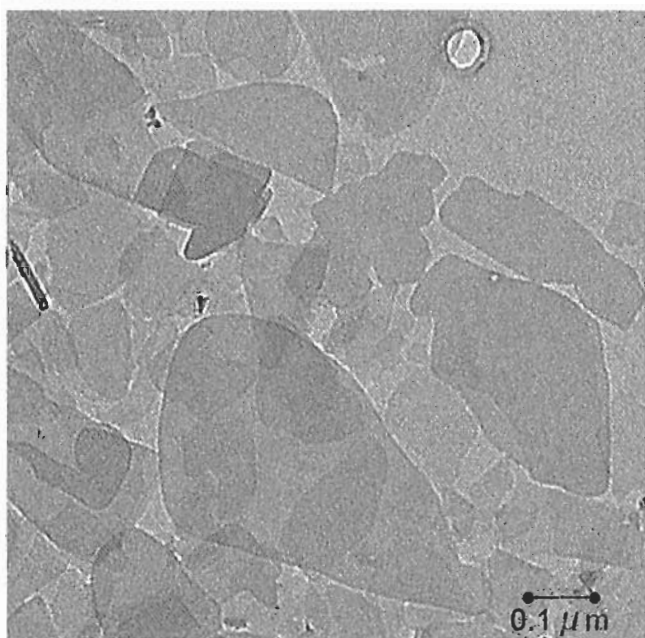
Antiseptic ingredients (ethanol, butylene glycol and methyl p-hydroxybenzoate) are added to the material.

It contains 12 to 16% silica secondary particles (0.05 to 0.5 μm in thickness, 0.1 to 5 μm in surface diameter and 0.5 μm in mean particle diameter) (SiO_2 purity is 99.0% or higher).

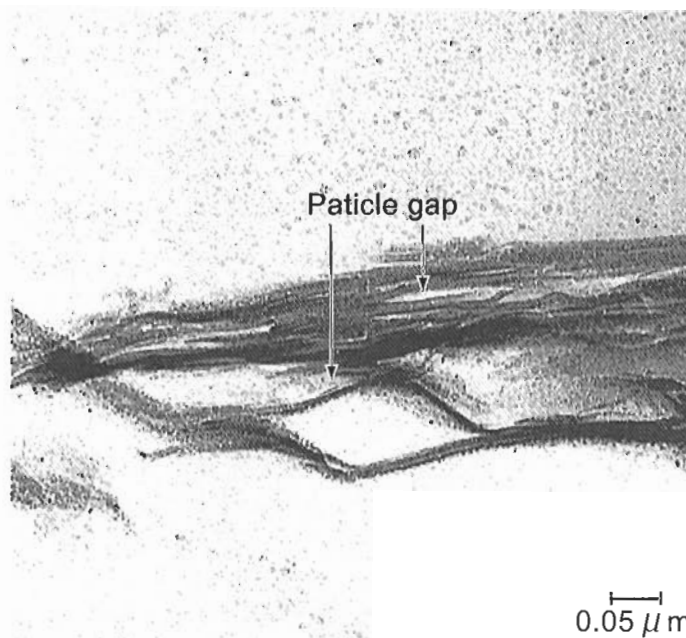
The particles are amorphous and safe and do not contain animal-derived ingredients.

The amount of silanol groups ($-\text{SiOH}$) per specific surface area is very large, 50 to 70 $\mu\text{mol}/\text{m}^2$ (several to dozens of times that of silica gel). It can form a tough film consisting of scaly silica fine particles laminated in parallel.

It has an inherent film forming ability. When added to cosmetics, it improves the adhesion to the skin, moisture retention and resistance and helps the makeup last.



TEM photograph (plan view)



TEM photograph (sectional view)

Specifications

Properties	Specification	Measuring method
Appearance	White odorless and tasteless powder	Organoleptic examination
Identification test (1) Precipitation test	White gel precipitate occurs. Precipitate is insoluble in diluted hydrochloric acid.	Silicic anhydride identification test (1) specified in the Japanese Standards for Cosmetic Ingredients
(2) Color test	Precipitate is blue.	Silicic anhydride identification test (2) specified in the Japanese Standards for Cosmetic Ingredients
Purity test (2) Heavy metals	30 ppm maximum	Silicic anhydride identification test (2) specified in the Japanese Standards for Cosmetic Ingredients
(3) Arsenic	5 ppm maximum	Silicic anhydride identification test (3) specified in the Japanese Standards for Cosmetic Ingredients
Condensation residue	14.0 to 19.0%	Japanese Standards for Cosmetic Ingredients (1g, 105°C, 2hrs.)
Ignition residue	12.0 to 16.0%	Japanese Standards for Cosmetic Ingredients (1g, 850°C, 0.5hr.)
pH	6.0 to 8.0	(10% water slurry)

Possible applications

When mixed in cosmetics, it provides a soft diffused light effect and matte texture. It can be used in cosmetics foundations, nail lacquer, lipsticks, eyeliner, mascara, sunscreen and various skincare products (crem, emulsion, essence and lotion) .

Improved moisture resistance (moisture resistance of O/W sunscreen)

【Test method】

Sunscreen cream was applied to a thickness of 6 μm to a quartz plate with a doctor blade as a specimen. After the cream was dried at 40°C for 30 minutes, the specimen was immersed in a water bath at 25°C, and it was exposed to flowing water for 5 minutes. The pictures of the specimen before and after immersion were scanned into a personal computer, and the residual ratio of the cream was determined after image processing.

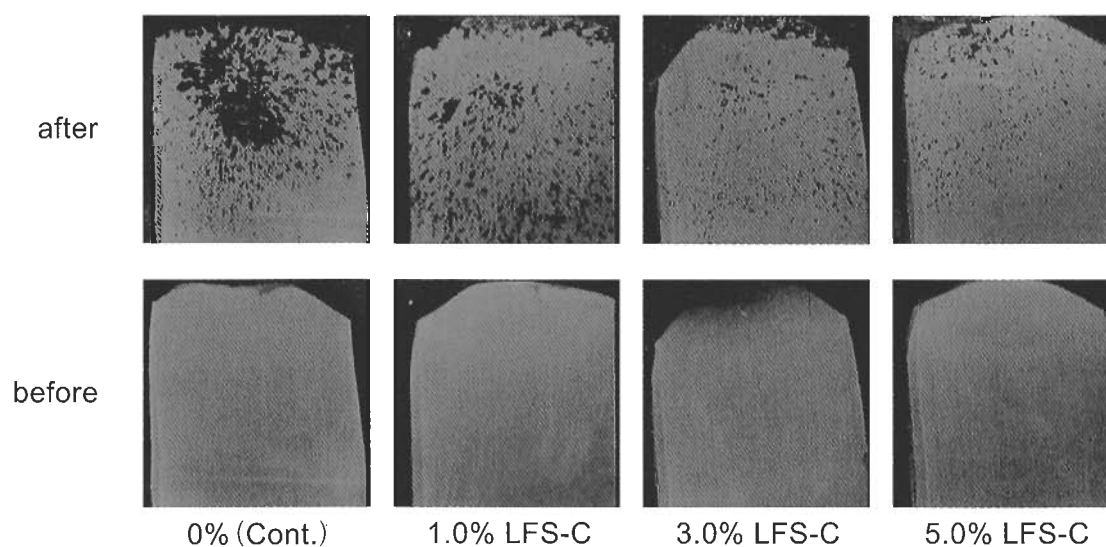
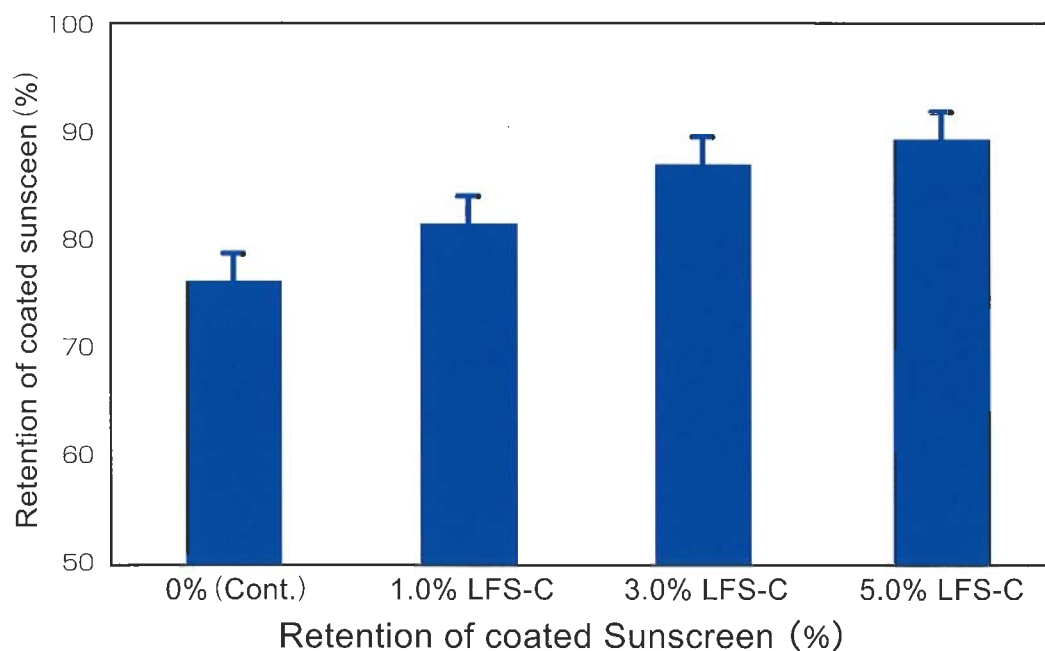


Photo of quartz plate applied with Sunscreen cream



Functional scaly silica

SUNLOVELY® LFS

SUNLOVELY LFS is new functional fine particle water slurry with parallel (two-way) overlapping scaly secondary particles of silicon dioxide (SiO_2) are dispersed in water. Various types differing in mean size of secondary particles are available.

Features

The primary non-porous scaly particles with a maximum thickness of $0.05 \mu\text{m}$ or less in thickness and have very high transparency.

The secondary particles are 0.05 to $0.5 \mu\text{m}$ in thickness and 0.1 to $5 \mu\text{m}$ in diameter.

The amount of silanol ($-\text{SiOH}$) compound per specific surface area is very large, 20 to $70 \mu\text{mol/m}^2$ (several to dozens of times that of silica gel).

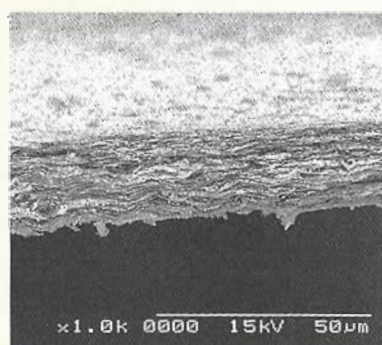
Since it has a large specific surface (50 to $400 \text{ m}^2/\text{g}$) and spaces/intervals (0.05 to 1.0 cc/g) between the particles, it can bind various functional fine particles (UV shielding agents, pigments, fragrances and various effective ingredients) to its surfaces and in its intervals to significantly effectively, easily and uniformly disperse and support these particles.

It has excellent moisture and chemical resistance.

It has excellent thermal resistance (max. 900°C).

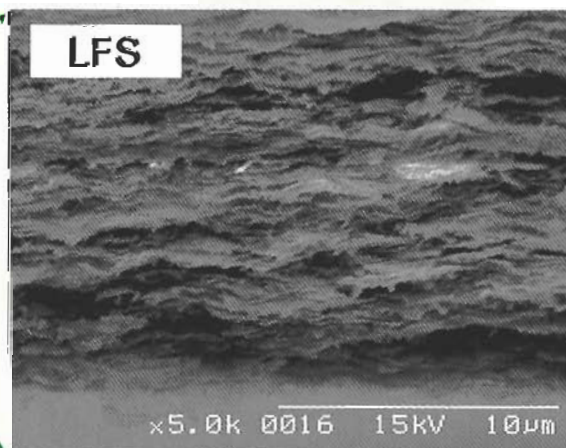
Inherent film formability of SUNLOVELY LFS

SUNLOVELY LFS is water slurry and can be directly applied to substrates. Since it has a specific inherent film formability, tough coating can be obtained only by drying it at normal temperatures. This is because scaly silica fine particles are laminated in parallel with the substrate and the silanol groups on the surface link together. Heating further improves the strength. With a maximum coating thickness of $30 \mu\text{m}$, when the coating is bent, the laminated layers slightly shift to exhibit flexibility and do not cause cracking in the coating.



Cross-section of coating

Magnification



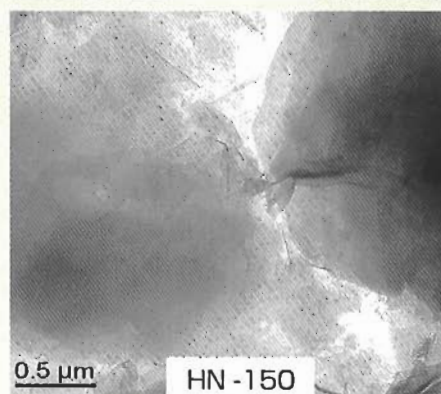
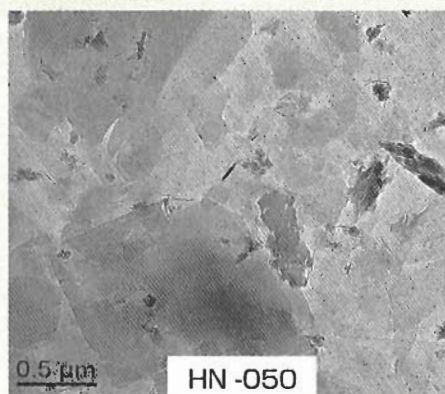
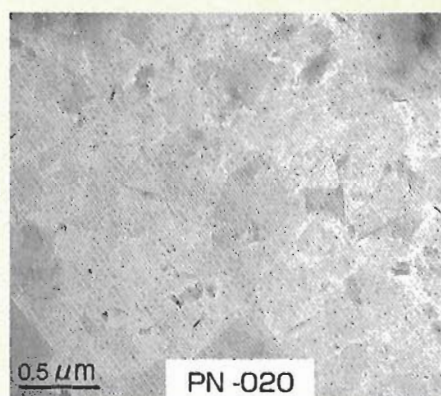
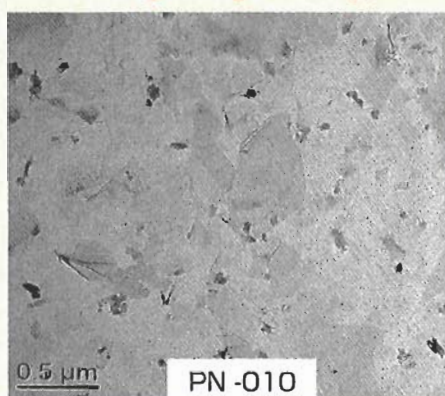
Physical properties of LFC (for general purposes)

Types of SUNLOVELY LFS

	SUNLOVELY LFS			
	PN-010 *1)	PN-020 *1)	HN-050 *2)	HN-150 *2)
Appearance	Slurry with scaly silica secondary agglomerated particles dispersed in water			
Silica concentration (%)	7 to 9	10 to 12	14 to 16	15 to 17
Mean particle diameter (μm)	0.1	0.2	0.5	1.5
Silica purity (%)	≥ 98			
pH	Neutral *2)			
Surface diameter (μm)	0.05 to 1	0.05 to 1	0.5 to 3	1 to 5
Particle thickness (nm)	10 to 100	10 to 100	50 to 500	50 to 500
Specific surface (m^2/g)	to 370	to 200	to 150	to 70
Silanol group (micro-mol/ m^2) (micro-mol/g)	to 20 to 7500	to 24 to 4900	to 30 to 4600	to 57 to 4100

*1) These are trial products. To obtain samples, contact us.

*2) Types having low salt concentrations in the slurry and having pH showing alkalinity are available.
Please consult us regarding these types.



Physical properties of SUNLOVELY LFS single coating

Coating component : SUNLOVELY LFS HN-150

Substrate : Glass plate

Appearance of SUNLOVELY film	Drying	Pencil strength (hardness)	Cross-cut adhesion test	Acid resistance/ Moisture resistance	Alkali resistance
20- μ m thin film	Drying at room temperature	4H	10	No changes	No changes
	100°C	4H			
	200°C	5H			
	300°C	6H			
	400°C	7H			
	500°C	9H or harder			
20- μ m thin film	600°C	9H or harder	10	No changes	No changes
100- μ m thick film	Drying at room temperature	9H or harder	10	No changes	No changes

Moisture resistance: Immersion in pure water for 24 hours at room temperature

Acid resistance test method: Immersion in 5-wt% sulfuric acid for 24 hours at room temperature

Strength of LFS composite film

Type of resin	Type of LFS	Correlation between percentage of LFS added and improvement of pencil strength of film												
		4B	3B	2B	B	HB	F	H	2H	3H	4H	5H	6H	7H
No additive	HN-150										●			
	HN-050													●
	HN-020													●
Acrylic resin	HN-150	○				→● 10%		→● 30%	→● 50%					
Acrylic urethane	HN-150						○			→● 15%				
Epoxy	HN-150				○	→● 15%								
Silicone	HN-150	○				→● 15%								
Fluoroplastics	HN-150	○	→● 10%							→● 50%				
	HN-050	○	→● 10%							→● 50%				
	WB-010	○				→● 10%		→● 50%						

Drying conditions : For 24 hours at normal temperature ○ : LFS not added ● : Solid content ratio of compounded LFS

Expected applications

- When the slurry is applied to a substrate and dried, it exhibits an extremely unusual inherent film formability as inorganic particles, and the scaly silica fine particles form a tough and flexible inorganic film laminated in parallel with the substrate. Thus, it is suitable for improving the physical properties of inorganic coating agents.
- Since it is in a water slurry state, it can be easily blended with aqueous emulsions of organic polymeric resins and water-soluble organic polymeric resins. It improves their physical properties, such as strength and hardness, lends in the surface hydrophilic nature and reduces the gas transmission.

It is suitable as a filler for paint and organic coating agents.

- It can uniformly support functional fine particles (TiO_2 , ZnO , etc.) and exhibits a binder effect when applied to a substrate to form a dry film. It is suitable to bind for completely inorganic materials.

Fields of use	Examples of functional materials to be compounded	Functions given to films and hardened bodies
Material for inorganic paints	None	Moisture resistance, acid resistance, alkali resistance and thermal resistance
Improvement of quality of existing paints	Water emulsion paint	Alkali and corrosion resistance, improvement of rigidity and hydrophilic nature
Thermal applications	High-insulation fine particles	Insulating function
Optical applications	TiO_2 and ZnO fine particles	UV shielding function
Electromagnetic applications	Conductive fine particles	Radio wave absorbing function and electromagnetic wave shielding function
Adsorption applications	Adsorptive particles	Adsorption and desorption functions
Catalytic applications	TiO_2 (anatase) fine particles	Photo-oxidative catalytic function
Antibacterial applications	Antibacterial agents	Antibacterial function



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