WE ARE COLORING THE FUTURE.

株式会社サクラクレパス
SAKURA COLOR PRODUCTS CORPORATION

Inquiry

7-18-47, Kano, Higashiosaka, Osaka 578-0901, JAPAN
Plasma Indicator Division
TEL: +81-72-873-5507 FAX: +81-72-875-5527
https://plazmark.craypas.co.jp

Osaka Factory is
ISO9001/ISO14001 certified.

2025.01 ver.7.1E

PLAZMARK®

Evaluation tool of plasma treatment effects

Plasma Indicator™

Visualize The Plasma Process
with color change

Plasma treatment increasingly used in various fields

Your treatment has an expected effect?

Adjusting the device after maintenance is a hassle?

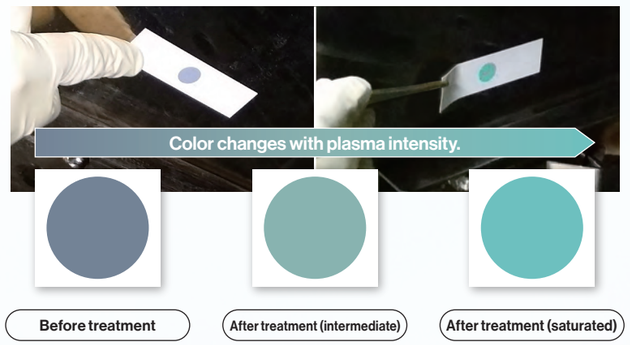
Parameters are easy to set?

Have trouble with process control?

The effect of plasma treatment can be easily evaluated with “color”!

PLAZMARK®

Plasma Indicator™ PLAZMARK® is an evaluation tool that changes color when detecting radicals and ions. No costly devices or special skills are required.



* Example of PLAZMARK® for O2/Ar plasma cleaning

Official mascot
“Ionization superman Captain Plasma”

Check out our website for more details!!

Easy

Just place/stick and check after treatment

- The effect is simply indicated by color.
- No professional skills are required and it is easy to use without hassle.
- It comes in various shapes to suit different situations and meet a wide range of needs.

Reliable

Results are shown, kept and quantified

- Relative evaluations including distribution and reproducibility are available.
- The resultant color can be kept as evidence.*1
- Color difference measurement enables numerical management, which makes it possible to examine correlations with evaluatio results in existing methods.*2

*1: Excluding heat resistant labels and ceramic wafers. *2: The correlations need to be examined by users.

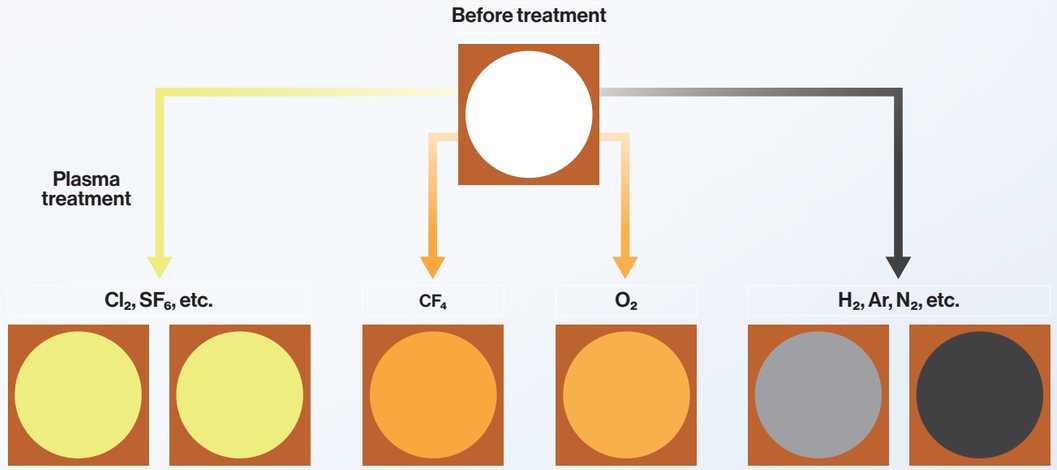
Higher efficiency

Easy and quick

- No expensive evaluation device is required, which helps reduce cost.
- Evaluation time is reduced, which is expected to improve overall productivity.
- In-plane distribution can be evaluated easily, which leads to stable quality and higher yield.

Plasma treatment effect can be checked on the spot with “color change.”

* Example of PLAZMARK® Heat-resistant Label and ceramic wafers



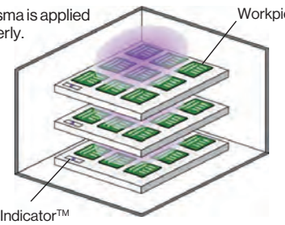
Visualizing the plasma process

Applications of PLAZMARK®

Visualizing a plasma process enables various checks!

1. Check plasma treatment effects.

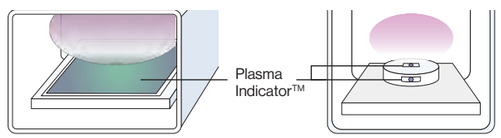
Check whether plasma is applied to the surface properly.



- Check for a normal condition
- Check of reproducibility
- Device management

2. Check in-plane uniformity.

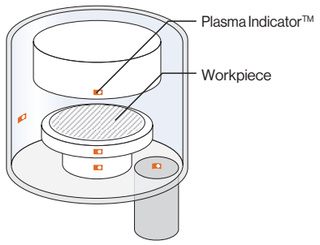
Check plasma uniformity and distribution.



- Check in-plane uniformity
- Detection of abnormal discharge
- Check of effects in 3D geometry

3. Check the spread of plasma.

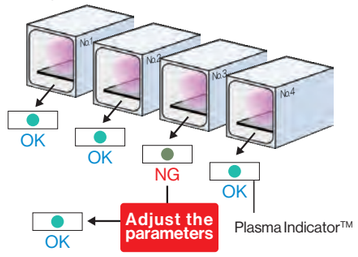
Check the effects of plasma on the surrounding parts.



- Check of plasma confinement effect
- Check of effects on surrounding parts
- Check for sneaking into the rear and penetration into the exhaust port

4. Check performance difference between devices.

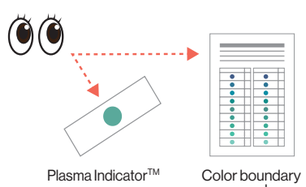
Check the treatment effects of plasma devices of the same model used for the same process.



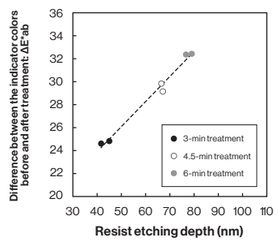
- Reduction of variance between devices
- Quick troubleshooting

Improving efficiency in plasma treatment effect check

Easy check with visual confirmation

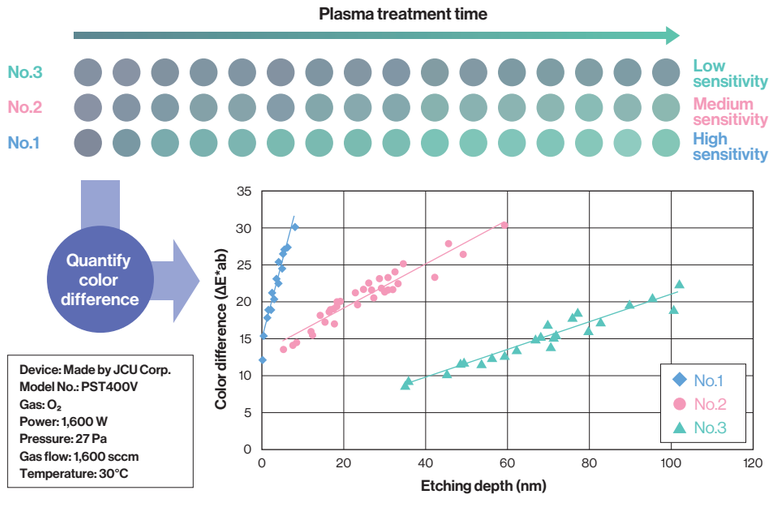


Correlations with existing evaluations



Evaluation method of color change level

The degrees of color changes can be quantified, using a device* commonly available in the market as spectrophotometer, colorimeter or color difference meter. The quantification makes it easy to evaluate subtle color differences hard to distinguish by the human eye.

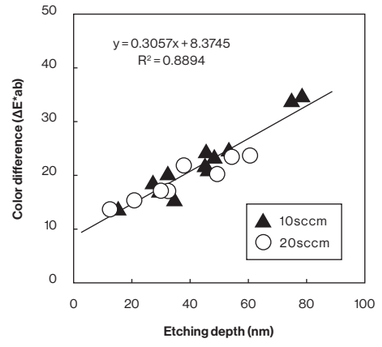


Combined use with or replacement of conventional evaluation methods

If the color change range of the indicator matches the range of conventional measurement values, the conventional measurement values can be converted to color differences by creating a calibration curve.

■ Example of correlation between resist etching depth by O_2 plasma and color difference

Time (min.)	10 sccm			20 sccm
	No.1 high sensitivity	No.2 medium sensitivity	No.3 low sensitivity	No.3 low sensitivity
0 (Initial)				
3				
5				
7				
10				



Device: Made by Samco Inc.
Model No.: BP-1
Gas: O_2
Power: 15 W
Pressure: 100 Pa

* It is necessary to check whether the indicator color change range matches the measurement ranges, such as contact angle and etching depth. The testing should be conducted by the user because the color change range depends on the device used and the plasma treatment conditions (e.g., type of gas, flow rate, treatment time and output).

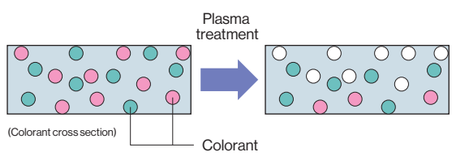
* There are no dedicated or recommended devices for the Plasma Indicator (except for some products).

PLAZMARK® lineup

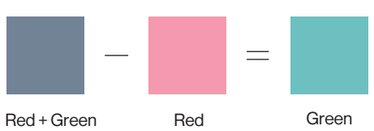
Organic colorant

Color change mechanism

Two types of color materials, highly reactive and hardly reactive to active species, are contained.
Color of the indicator changes as active species in plasma causes the highly reactive colorant to lose color.



■ For cleaning

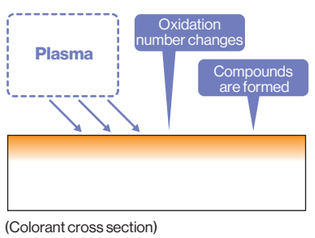


Hues of color changes are fixed regardless of gas type.

Inorganic colorant

Color change mechanism

The product contains an oxide the crystal color of which varies with the oxidation number.
By the reaction to radicals or ions in plasma, the oxidation number changes or chemical compounds are formed and the color changes.



Before treatment	After treatment (by process gas)					
	$Ar+N_2$	O_2	H_2	CF_4	SF_6	Cl_2

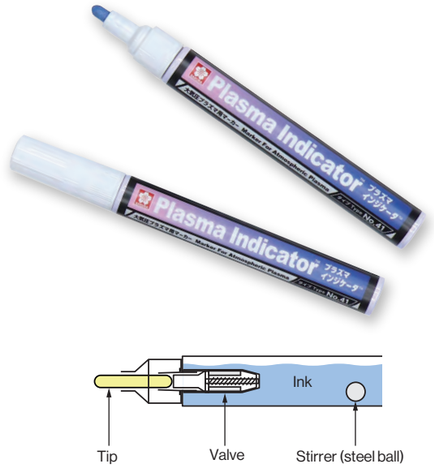
Hues of color changes vary with gas type.

* Because the color change is based on redox reactions, when the coating film comes in contact with air after treatment, it tends to return to its original color of white (does not return fully).
We recommend measuring color difference as soon as possible after treatment or photographing the result as a record.

Marker for atmospheric plasma

Check it out on the website.

Up to 100℃ | Organic colorant



Suitable for normal pressure / cleaning processes

Indicator suitable for intricate areas or curved surfaces the conventional products cannot be used for

- Plasma treatment on a small workpiece or a complex shape can be easily visualized.
- It can be also used on flexible base materials to check plasma treatment in a roll-to-roll process.
- As it comes in the form of a marker, it is easy to use and requires low running cost.

Color change characteristics

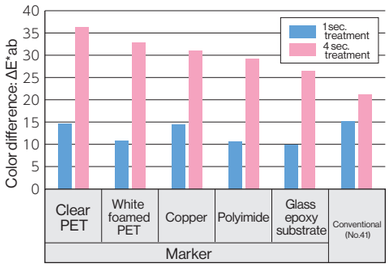
Suitable for a wide range of materials, thanks to the high concealing capacity of ink.

Device: Made by Denshi Giken Co., Ltd.
Model No.: AP-2000
Gas: Dry air
Power: 7.0 kV
Gas flow: 50 SLM
Time: 1 sec. and 4 sec.

■ **Paint color samples of atmospheric plasma treatment**

Base material		Marker: Clear PET	Marker: White foamed PET	Marker: Copper	Marker: Polyimide	Marker: Glass epoxy substrate	Conventional (No.41)
Initial							
After treatment (7.0 kV)	1 sec.						
	4 sec.						

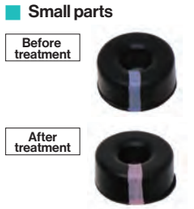
■ **Color difference of atmospheric plasma treatment**



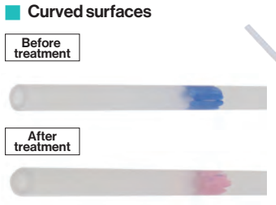
With this product, you can easily evaluate materials or locations that otherwise cannot be checked for treatment effects.

■ **Intricate areas**

■ **Small parts**



■ **Curved surfaces**



Product specification

Series name	Detection capacity: Gas type (plasma type) ★	Detection capacity: Sensitivity	Form	Heat resistance	Structure	Size	Line width	Q'ty/ pack	Code
PLAZMARK® marker for atmospheric plasma	O_2, N_2, Air	No.41 (High sensitivity)	Marker	100℃ (Marked lines)	Body: Aluminum and resin Tip: Polyester fiber Ink: Alcohol ink (Organic and inorganic colorant)	Length: 142 mm, max diameter: 15 mm	Approx. 1.5 mm	1 pc.	PLKM-41

★The specification shows gas types we have tested to confirm the compatibility. They do not represent all compatible gases including mixtures.
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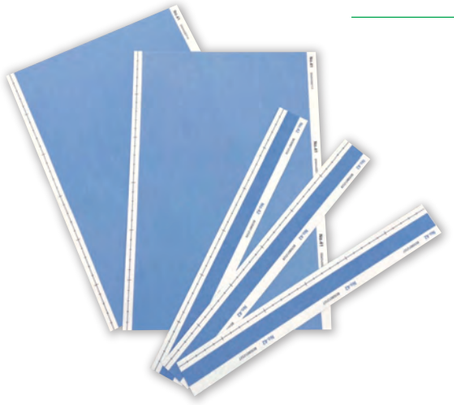
For atmospheric plasma

Up to 100℃ Organic colorant



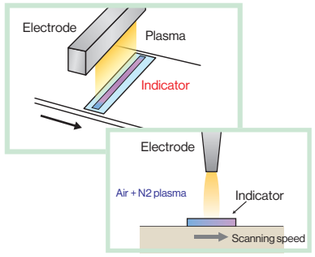
Suitable for normal pressure / cleaning processes

Detection specialized for atmospheric plasma radicals

Suitable for examination of atmospheric (normal) plasma treatment for large areas, such as onboard components, PCB manufacturing, FPD manufacturing, and film processing. Also suitable for spot irradiation, e.g., surface modification prior to resin bonding.

Can be used for UV and UV-ozone cleaning.

Color change characteristics



Device: Made by Denshi Giken Co., Ltd.
Model No.: AP-2000

Gasses: N^2 (70 SLM), Air (2 SLM)
Power: 7.5 kV
Irradiation distance: 5 mm

	Processing speed (mm/min)						
	Initial	3000	1500	1000	300	300 (2 times)	300 (6 times)	300 (9 times)
No.40 (Ultra-high sensitivity)								
No.41 (High sensitivity)								
No.42 (Low sensitivity)								

Product specification

Series name	Detection capacity		Form	Heat resistance	Structure	Size	Q'ty/ pack	Code
	Gas type (plasma type) ★	Sensitivity						
PLAZMARK® for atmospheric plasma	O_2, N_2, Air	No.40 (Ultra-high sensitivity)	Long label (Adhesive)	100℃	Substrate: Clean paper Detection part: Organic colorant and resin	Substrate : 35×300×0.2mm Detection part : 300×15mm	20 pcs.	PLL0430-40
			Sheet			Substrate : 210×300×0.2mm Detection part : 190×300mm	5 pcs.	PLC2130-40
		No.41 (High sensitivity)	Long label (Adhesive)			Substrate : 35×300×0.2mm Detection part : 300×15mm	20 pcs.	PLL0430-41
			Sheet			Substrate : 210×300×0.2mm Detection part : 190×300mm	5 pcs.	PLC2130-41
		No.42 (Low sensitivity)	Long label (Adhesive)			Substrate : 35×300×0.2mm Detection part : 300×15mm	20 pcs.	PLL0430-42
			Sheet			Substrate : 210×300×0.2mm Detection part : 190×300mm	5 pcs.	PLC2130-42

★The specification shows gas types we have tested to confirm the compatibility. They do not represent all compatible gases including mixtures.
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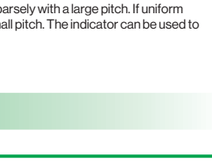
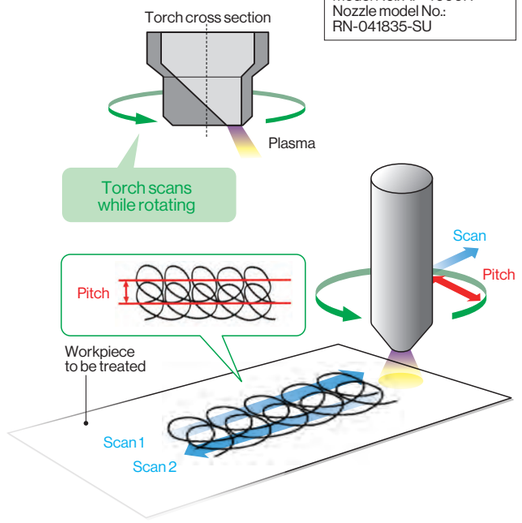
Sensitivity	Within each series, smaller numbers indicate higher sensitivity. They change colors with low-power short-time plasma treatment. The numbers in one series have no correlation with those in another series.



Use case

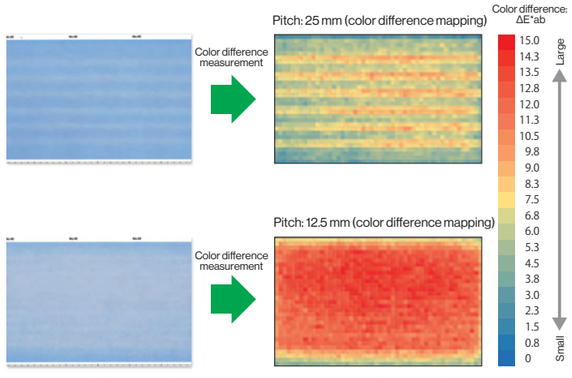
Use with atmospheric plasma torch

Device: Made by AETP
Model No.: AP-4000R
Nozzle model No.: RN-041835-SU



Color measurement was conducted using auto-scan spectrophotometer MYIRO-9 (made by Konica Minolta).

- Color changes show whether the surface is treated as intended.
- It can be also used to determine the optimum pitch for efficient treatment.

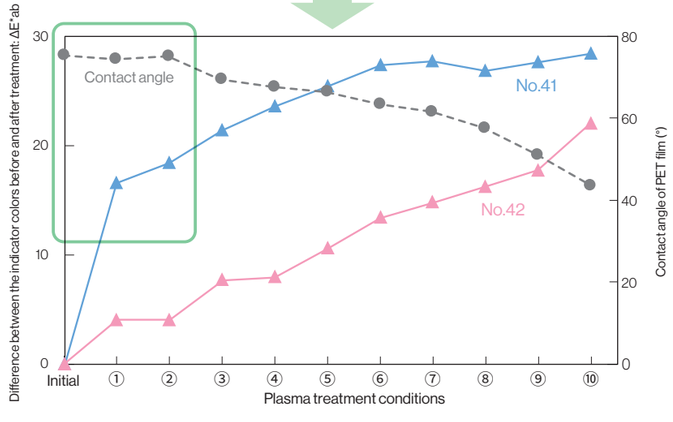


*When productivity is a priority, plasma should be applied sparsely with a large pitch. If uniform treatment is a priority, it should be applied densely with a small pitch. The indicator can be used to determine the pitch.

Correlation example

	Plasma treatment conditions										
	Initial	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
No.41 (High sensitivity)											
No.42 (Low sensitivity)											

Color difference measurement



Contact angle
Little changes with weak treatment

Indicator
Color difference changes continuously.

Weak plasma that cannot be evaluated with contact angle can be evaluated.

Plasma treatment conditions

Process condition	Power (kV)	Processing speed (mm/min)	Number of treatments (time)	Treatment intensity
①	10.0	3,000	1	Weak
②	10.0	2,000	1	
③	10.0	1,000	1	
④	10.0	600	1	
⑤	10.0	300	1	
⑥	12.5	300	1	
⑦	15.0	300	1	
⑧	10.0	300	2	
⑨	10.0	300	4	
⑩	10.0	300	10	Strong

Device: Made by Denshi Giken Co., Ltd.
Model No.: AP-2000

For O_2 cleaning / Ar cleaning

Up to 100℃ | Organic colorant

Check it out on the website.

For O_2 cleaning

For Ar cleaning

Suitable for surface mount / back-end processes

Versatile basic indicators suitable for different types of cleaning, surface treatment and other various purposes

Can be used for plasma treatments in back-end processes, such as surface modification prior to plating, and surface cleaning for wire bonding and flip chip bonding.

They come in three types; choose according to locations and purposes.

The indicators for O_2 cleaning are suitable for radical-rich plasma detection and those for Ar cleaning are suitable for ion-rich plasma detection.

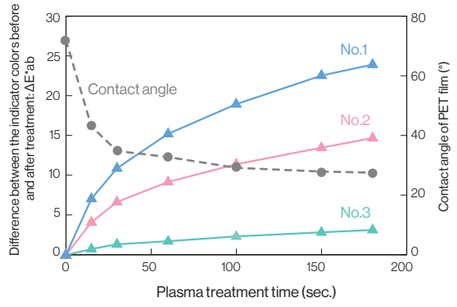
Correlation example

Correlation of the conventional method (contact angle) with color difference using the indicator card for O_2 cleaning

Device: Made by Samco Inc.
Model No.: BP-1
Gas: O_2
Power: 15 W
Initial Pressure: 2 Pa
Pressure: 10 Pa
Gas flow: 16 sccm

	Time						
	Initial	15 sec.	30 sec.	60 sec.	100 sec.	150 sec.	180 sec.
No.1 (High sensitivity)							
No.2 (Medium sensitivity)							
No.3 (Low sensitivity)							

Color difference measurement



Contact angle
Drastically decreases with short-time treatments.

Indicator
Color difference changes continuously.

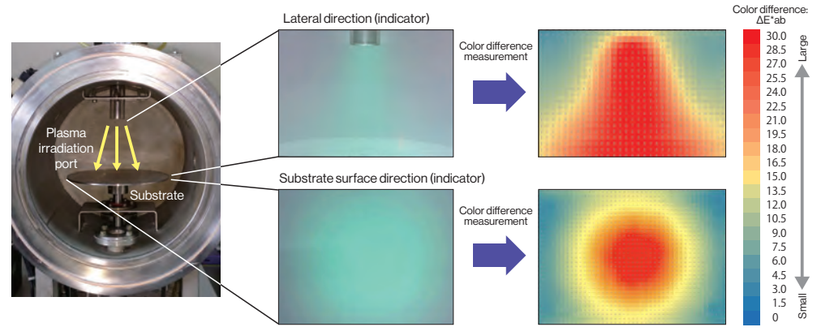
Plasma evaluation is possible in the regions where the contact angle is saturated.

Use case

Use of indicator sheet for O_2 cleaning

Using color changes, you can easily evaluate in-plane uniformity and reproducibility as well as check whether plasma is applied to the surface properly.

Device: Made by Shibaura Eletec Corp.
Gas: O_2 Pressure: 240 Pa
Power: 0.5 kW Time: 30 sec.



Product specification

Series name	Detection capacity: Gas type (plasma type) ★	Detection capacity: Sensitivity	Form	Heat resistance	Structure	Size	Q'ty/pack	Code
PLAZMARK® for O_2 cleaning	For O_2 and other plasma mainly consisting of radicals: O_2, N_2, Air, CF_4, H_2, NH_3, (Ar)	No.1 (High sensitivity)	Card	100℃	Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-01
			Label (Adhesive)				100 pcs.	PLL0207-01
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-01
		No.2 (Medium sensitivity)	Card		Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-02
			Label (Adhesive)				100 pcs.	PLL0207-02
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-02
		No.3 (Low sensitivity)	Card		Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-03
			Label (Adhesive)				100 pcs.	PLL0207-03
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-03
PLAZMARK® for Ar cleaning	For Ar and other plasma mainly consisting of ions: Ar, He and other noble gases difficult to detect with indicators for O_2 cleaning	No.20 (Ultra-high sensitivity)	Card	100℃	Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-20
			Label (Adhesive)				100 pcs.	PLL0207-20
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-20
		No.21 (High sensitivity)	Card		Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-21
			Label (Adhesive)				100 pcs.	PLL0207-21
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-21
		No.22 (Medium sensitivity)	Card		Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-22
			Label (Adhesive)				100 pcs.	PLL0207-22
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-22
		No.23 (Low sensitivity)	Card		Substrate: PET film Detection part: Organic colorant and resin	Substrate: 20×70×0.2mm Detection part: ϕ11mm	100 pcs.	PLC0207-23
			Label (Adhesive)				100 pcs.	PLL0207-23
			Sheet			Substrate: A4 size (210×297×0.2mm) Detection part: 190×260mm	5 pcs.	PLC2130-23

★The specification shows gas types we have tested to confirm the compatibility. They do not represent all compatible gases including mixtures.
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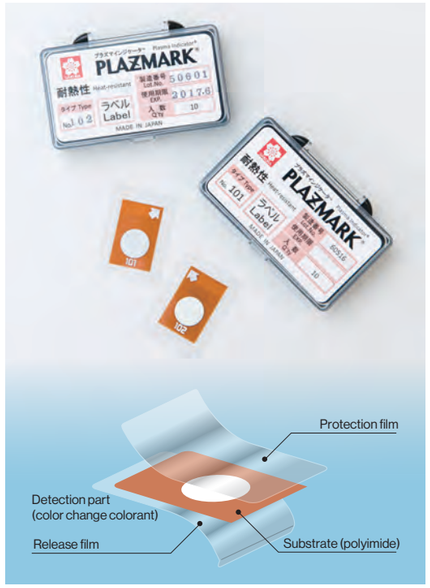
Sensitivity	Within each series, smaller numbers indicate higher sensitivity. They change colors with low-power short-time plasma treatment. The numbers in one series have no correlation with those in another series.

Heat-resistant Label

Up to 200℃ | Inorganic colorant



* Remove the protection film and the release film before use.

Suitable for high temperature process

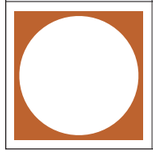
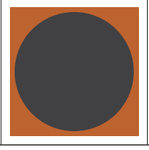
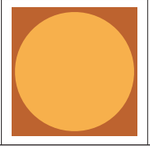
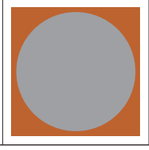
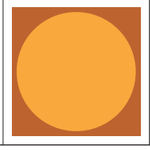
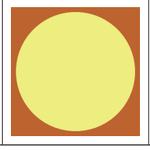
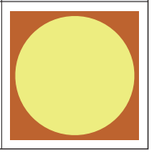
High heat resistance (200°C) is achieved by the use of inorganic colorant.

This indicator is designed to resist heat of high-density long-hour plasma treatment, such as ashing.

The polyimide film coated with inorganic colorant is flexible and adhesive. The indicator can be affixed to the substrate surface or inside the device for evaluation.

Color hues after plasma treatment vary with gas type.

Color change characteristics

Before treatment	After treatment					
	$Ar \cdot N_2$	O_2	H_2	CF_4	SF_6	Cl_2
						

* Because the color change is based on redox reactions, when the coating film comes in contact with air after treatment, it tends to return to its original color of white (does not return fully).

Product specification

Series name	Detection capacity		Form	Heat resistance	Structure	Size	Q'ty/ pack	Code
	Gas type (plasma type) ★	Sensitivity						
PLAZMARK® heat resistant label	Ar, O_2, H_2, CF_4, SF_6, Cl_2, N_2	**No.101** (High sensitivity)	Label (Adhesive)	200℃	Substrate: Polyimide Detection part: Inorganic colorant and resin	Substrate : 16mm×25mm×80μm Detection part : ϕ10mm	10 pcs.	PLL0203-101
		No.102 (Low sensitivity)						PLL0203-102

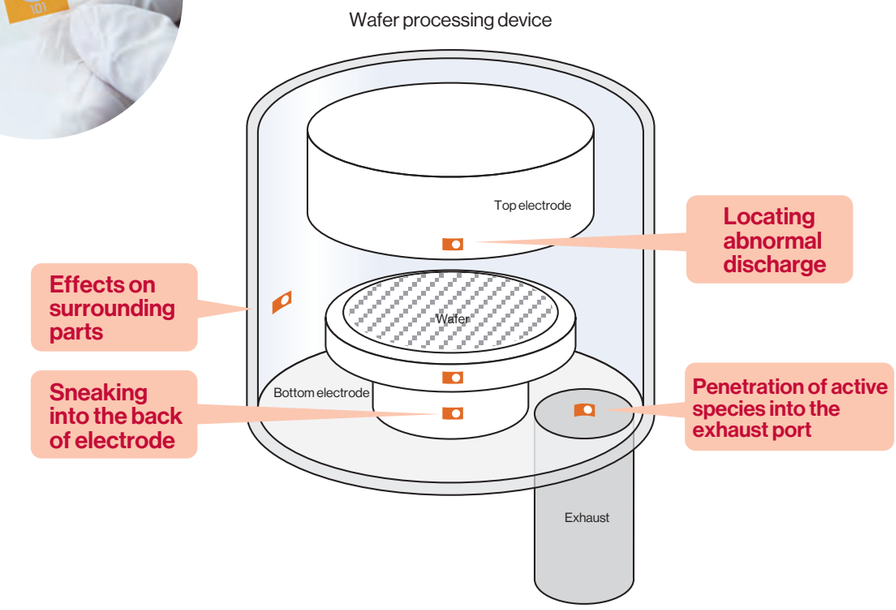
★The specification shows gas types we have tested to confirm the compatibility. They do not represent all compatible gases including mixtures.
* PLAZMARK and Plasma Indicator are registered trademarks or trademarks of Sakura Color Products Corporation. PLAZMARK is registered in Japan, EU, USA and other countries.

Sensitivity	Within each series, smaller numbers indicate higher sensitivity. They change colors with low-power short-time plasma treatment. The numbers in one series have no correlation with those in another series.	No. Small / No. Large ↕ Sensitivity High / Sensitivity Low

Use case

Use of heat-resistant label

This indicator can be used to check the effects on the surrounding parts and plasma confinement effect because it is small in size and adhesive.
It is also suitable for device maintenance and troubleshooting, not only check of treatment effects.

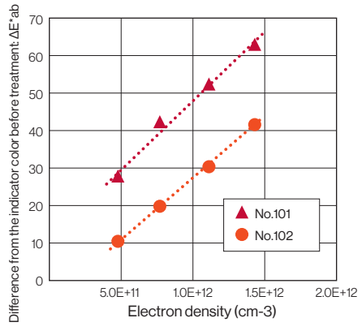


Correlation example

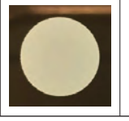
Correlation between electron density and color difference

A correlation is found between electron density and color difference. Using PLAZMARK®, plasma evaluation is more easily conducted than that by probe measurement.

Device: Made by Arios Inc. Equipment Type: ICP	Gas: Ar Power: 60 - 200 W Pressure: 10 Pa Time: 90 sec.



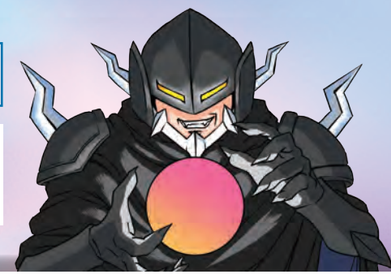
■ Color changes with plasma electron density (cm-3)

	Blank	4.8E+11	7.7E+11	1.1E+12	1.4E+12
No.101 (High sensitivity)					
No.102 (Low sensitivity)					

Metal-free wafer

Up to 250℃ | Organic colorant

Check it out on the website.



Suitable for wafer processing

The cleanest product of all the PLAZMARK® lines

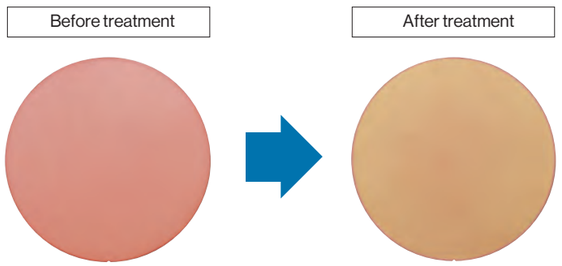
The contamination of metal is minimized and thus the indicator is suitable for silicon semiconductor manufacturing and other processes susceptible to risk of contamination.

This indicator is a silicon wafer with a coating film formed and can be handled as usual.

With this product, you can easily evaluate in-plane uniformity.

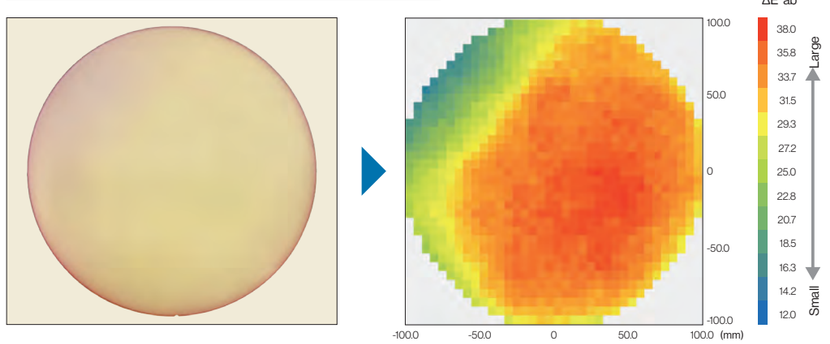
Color change characteristics

Before treatment → After treatment



■ Photo and mapping image of the indicator after treatment (φ 200 mm)

Device: Made by Seinan Industries Co., Ltd.	Equipment Type: CCP Gasses: O2 + CF4 (1:1) Power: 50 W	Pressure: 20 Pa



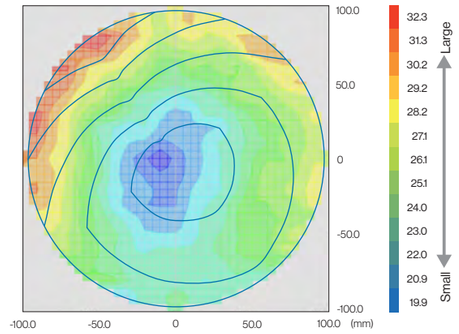
Colorimeter made by PaPaLab Co., Ltd.
Analysis result using PPLB-420

Distribution evaluation example

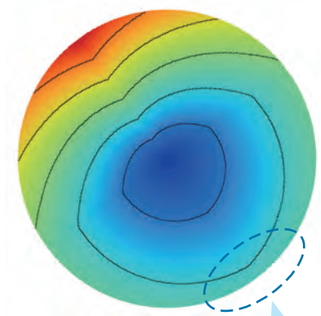
Comparison in distribution between etching depth by an etcher and color change

It is found that the tendency of color change is similar to the etching depth distribution.
(The color of the area where plasma is weak because of the electrode mounting is included.)

■ Color change map



■ Etching depth distribution (provided by the manufacturer)
* The evaluation was conducted under particular conditions to generate a distribution.

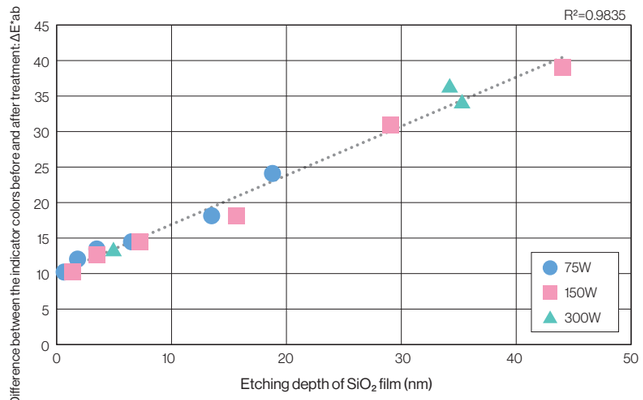


In the vicinity of the antenna electrode mounting, the etch rate tends to become low.

Correlation example

Correlation confirmed between etching depth of general SiO_2 film and color difference

Device: Made by Arios Inc.
Equipment Type: ICP
Gassses: CF_4+O_2 (flow ratio 1:1)
Pressure: 10 Pa



Product specification

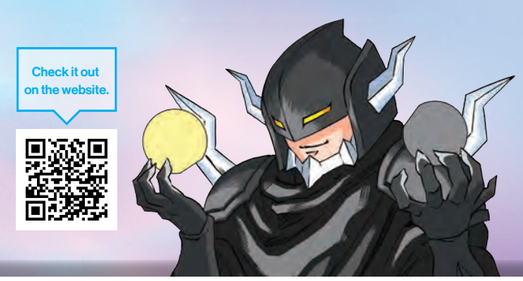
Series name	Detection capacity		Form	Heat resistance	Structure	Size	Q'ty/pack	Code
	Gas type (plasma type) ★	Sensitivity						
PLAZMARK® Metal-free wafer	O_2, CF_4, Ar, SF_6 etc.	1 type	Wafer (orientation flat)	250℃	Substrate: Silicon Detection part: Organic colorant and resin	Substrate : Φ4 inch Coating thickness : 30μm	1pc.	PLW100SI-MF
						Substrate : Φ6 inch Coating thickness : 30μm	1pc.	PLW150SI-MF
			Wafer (V-notch)			Substrate : Φ200mm Coating thickness : 30μm	1pc.	PLW200SI-MF
						Substrate : Φ300mm Coating thickness : 30μm	1pc.	PLW300SI-MF

★The specification shows gas types we have tested to confirm the compatibility. They do not represent all compatible gases including mixtures.

*The cases for PLW200SI-MF and PLW300SI-MF are optional extras.

Ceramic wafer

Up to 400℃ | Inorganic colorant

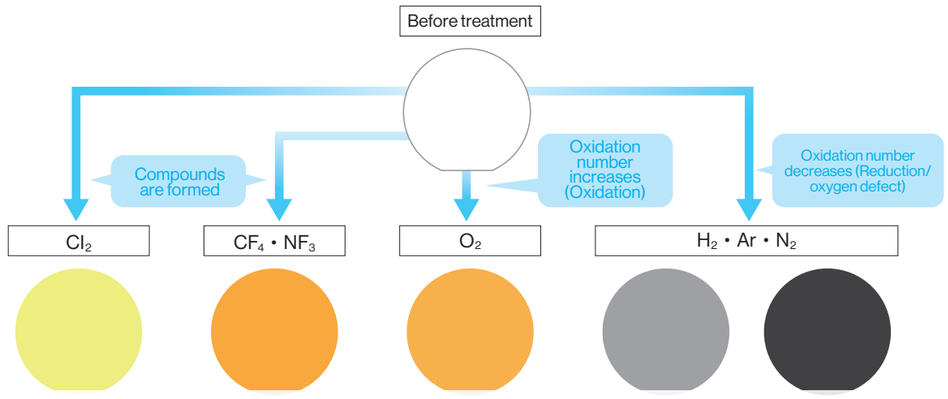


Suitable for wafer processing

Heat resistance of 400℃ and easy check of distribution evaluation of high temperature process

- Ceramic film containing no organic materials is used to increase heat resistance to 400℃, which makes it safe to use for high temperature process.
- Designed for high cleanliness and suitable for LED and MEMS processes.
- Color hues after plasma treatment vary with gas type.

Color change characteristics



* Because the color change is based on redox reactions, when the coating film comes in contact with air after treatment, it tends to return to its original color of white (does not return fully). We recommend measuring color difference as soon as possible after treatment or photographing the result as a record.

Product specification

Series name	Detection capacity		Form	Heat resistance	Structure	Size	Q'ty/ pack	Code
	Gas type (plasma type) ★	Sensitivity						
PLAZMARK® Ceramic wafer	**Ar, O_2, H_2, CF_4 SF_6, Cl_2, NF_3, N_2**	1 type	Wafer (orientation flat)	400℃	Substrate: Silicon Detection part: Inorganic colorant	Substrate: ϕ4 inch Coating thickness: 5μm	1 pc.	PLW100SI
						Substrate: ϕ6 inch Coating thickness: 5μm	1 pc.	PLW150SI
			Wafer (V-notch)			Substrate: Φ200mm Coating thickness: 10μm	1 pc.	PLW200SI
			Wafer (orientation flat)		Substrate: Sapphire Detection part: Inorganic colorant	Substrate: ϕ4 inch Coating thickness: 5μm	1 pc.	PLW100SA

★The specification shows gas types we have tested to confirm the compatibility. They do not represent all compatible gases including mixtures.
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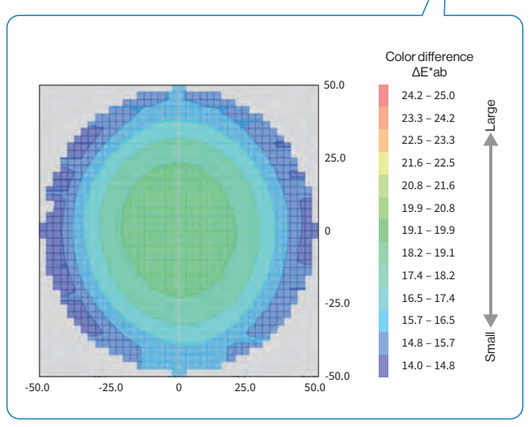
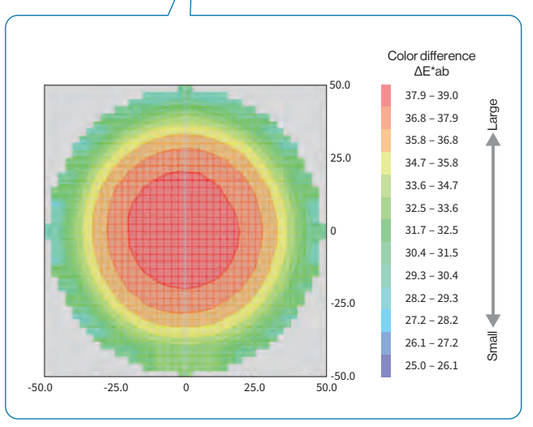
*The case for PLW200SI is an optional extra.

Distribution evaluation example

Color change distribution with Ar plasma

It is confirmed that the intensity differs between the center and the edge even if the distribution looks uniform to the human eye.
Using a mapping color difference meter, slight differences can be visualized.

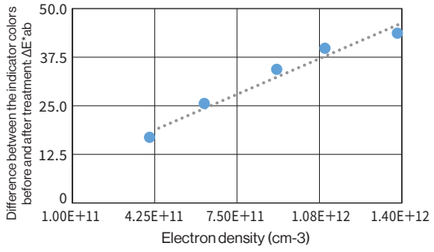




Correlation example

Correlation confirmed between electron density and color difference

Device: Made by Arios Inc.	ICP	Pressure: 10 Pa
Equipment Type:	Gas : Ar	Time: 6 min.
	Power: 100 - 300 W	



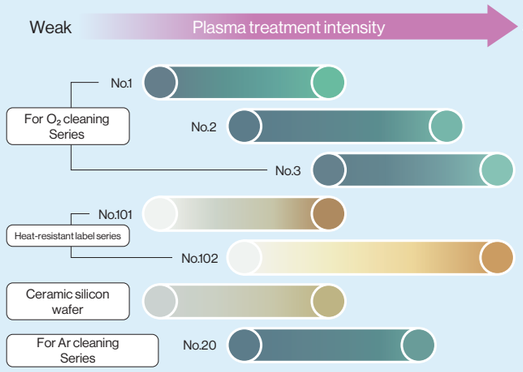
■ Color changes with plasma electron density (cm-³)

	4.1E+11	6.3E+11	9.1E+11	1.1E+12	1.4E+12
Heat resistant wafer					

PLAZMARK® lineup sensitivity comparison chart

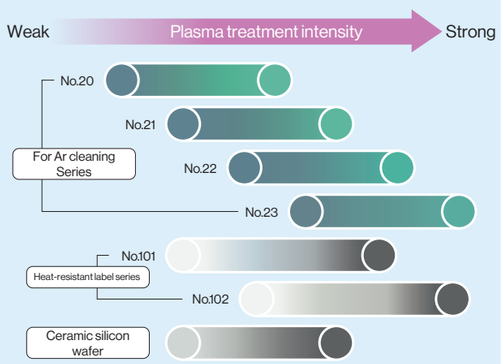
Plasma Indicator™ PLAZMARK® color changes in proportion to the accumulation of radical or ion density and irradiation time.
The chart below shows sensitivity comparison between typical PLAZMARK® indicators to relative intensity changes from low-density short-time "weak treatment" to high-density long-hour "strong treatment."

O_2 plasma treatment (in a vacuum)



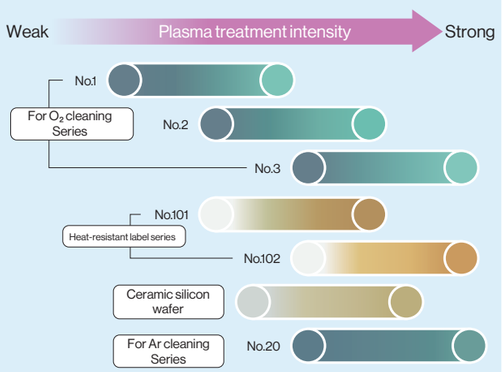
Application examples
- Cleaning before bonding
- Surface modification to improve wettability
- Organic residue removal and ashing

Ar plasma treatment (in a vacuum)



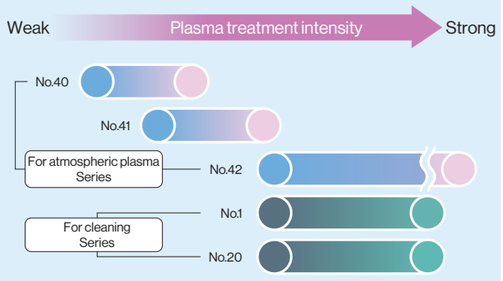
Application examples
- Cleaning before bonding
- Oxide film removal and etching
- Surface modification to improve wettability

CF_4 plasma treatment (in a vacuum)



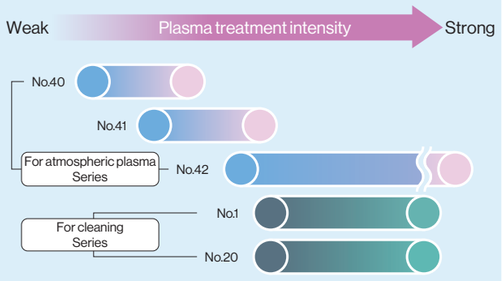
Application examples
- Cleaning and surface modification
- Oxide film removal and etching

Atmospheric plasma treatment (air only)



Application examples
- Adhesion enhancement
- Surface modification to improve wettability

Atmospheric plasma treatment (N_2 + air)



Application examples
- Adhesion enhancement
- Surface modification to improve wettability

Technology of Sakura Color Products Corporation

Evolution of colorants

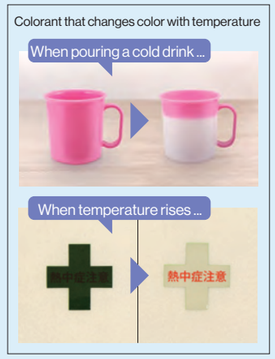
Sakura Color Products Corporation is pursuing technological development for innovation, such as new drawing and writing materials, indicator inks and industrial markers, making the most of its colorant technology accumulated over the past 100 years.

Our colorant technology has been delivering new products that meet the needs of the times for more than 100 years. We have enhanced quality of colorants including pigments and dyes, together with vehicles, water and solvent, to satisfy various needs of customers and situations.

In the field of markers, we have developed Solid Marker, a solidified paint, which is now indispensable to industrial fields, Low Halogen Marker with a low halogen and impurity content to prevent metal corrosion, and Metal Marker perfect for use in shipbuilding. These are examples of our constant effort for innovation.

■ Sterilization indicator (from 1975)

■ Thermochromic ink TC Color (from 1978)



■ Plasma Indicator™ PLAZMARK® (from 2014)

We are also developing medical products, such as sterilization indicator ink, by advancing the colorant technology we have honed through R&D for drawing and writing materials. The sterilization indicator is sterilized with medical devices and the indicator color shows whether the devices are properly sterilized. As safer and more reliable new sterilization methods are developed every year, we develop new indicators to fit their needs. The most recent development is the Plasma IndicatorTM and it is expected to be used in a wide variety of fields including electronics, automobile, aviation, aerospace and materials.