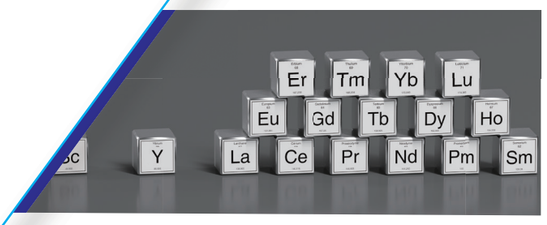
Insight & Innovation
TAKUBO

塗装道

TOSODO Japan Coating Technology



Indium used paint which is one rank higher, “ECO MIRROR 49※”

※MUSASHI Paint Holdings Co., Ltd.

What is Indium used paint (ECO MIRROR 49) ?

Indium in indium used paint is a rare metal with atomic number 49 and chemical symbol In. The simple substance is a soft, silver-blue-white metal that is stable at room temperature. It used to be produced in Japan, but now it is mostly made in China and imported from China. The origin of the name indium is said to be because the color of the emission line spectrum is indigo blue. It is a metal with a low melting point that is easy to handle, and has electrical conductivity and transparency. It was processed into an indium used paint (ECO MIRROR 49) for coating.

Sample work pieces for “ECO Mirror 49”

Why indium mirror coating now?

Growing demand for mass production of plating-like coating

Plating-like coatings have been developed using silver colloids and silver complexes for some time, but none of them have been put to practical use due to problems with weather resistance and corrosion resistance. On the other hand, the demand for plating-like coating is increasing more and more due to the high quality of equipment parts and environmental problems. Now, an epoch-making coating system using paint that takes advantage of the properties of indium has been realized through joint development by a paint manufacturer and an engineering manufacturer. A coating system has been completed that fully demonstrates the superior design and functionality of indium coatings through spray coating.

No choice of materials

Indium paint is compatible with all materials, regardless of the material. The undercoat enhances the adhesion of the indium paint.

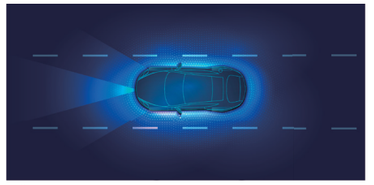
Process of Indium Mirror Coating

Basic process of Indium Mirror Coating System is 3-Coat and 3-Bake. However, depending on the material and design requirements, it is possible to add a plus coat to 4 coats.

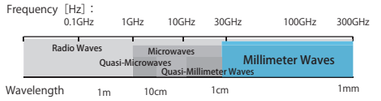
Indium coating that meets advanced coating requirements

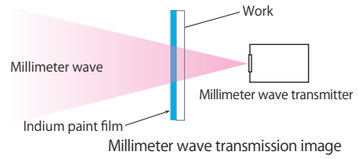
Functional coating, millimeter wave transparency

The indium paint forms an island-like structure film. In other words, there is radio wave permeability, and by making it ultra-thin with R technology, it is possible to create a coating film that does not easily deteriorate the characteristics of radio waves (5G, millimeter waves) used in smartphones, home appliances, and electronic equipment parts of automobiles.



Millimeter wave transmission image





Millimeter wave transmission image

Thin film coating technology, R-Technology

Coating technology, R-Technology holds the key to indium coating. Thin multiple coating is the key to determine the performance of the indium coating. The R-Technology, which allows film thickness adjustment, leads the indium film to a high-performance film and completes the plating-like coating by spraying.

A wide variety of design coatings

The expressive power of indium coating by spraying is rich. It enables a variety of expressions such as matte and piano black.

Image of coating samples

● **Basic process of Indium Mirror Coating System**

Under-coat → Bake → Indium-coat → Bake → Top-coat →Bake

※ECO MIRROR 49 in the indium used paint is a registered trademark of MUSASHI Paint Holdings Co., Ltd.

R-Technology to realize the indium used coating film

Plating-like coating, Indium mirror coating realized with the technology cultivated in revolving coating

Thin film control is the key to plating-like coating

The indium coating is a film that combines functionality such as millimeter wave permeability in addition to design. To take advantage of this function, it is important to realize a very thin film. Only the R-technology can realize thin film multi-layer coating with spray coating.

Thin film multi-layer coating, R-Technology

Syringe pump, paint supply device

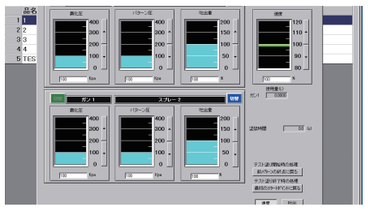
A paint supply device for a spray coating system that can simultaneously solve quality, cost, and environmental issues is required. The syringe pump system is systematized to control the paint with ultra-precision and supply the required amount to the gun exactly as required.

One-cup system

Syringe pump

Flexible film thickness control. Software to simplify condition setting.

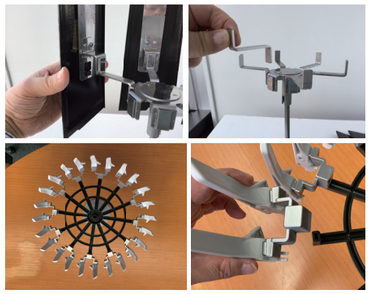
It is controlled by software "SWANIST" that reproduces thin film coating. SWANIST is an assistant software that controls coating equipment with advanced programs. This software simplifies the setting of coating conditions and enables management by quantifying the coating.



Setting screen of coating conditions, SWANIST

Coating jigs, Revolving jigs

・Workpiece detachability・Handling・Productivity・Ease of coating・Coating jigs, such as coating costs, reduce unnecessary movements of the robot and shorten coating time. It is an important factor that influences the coating cost. Jigs development is also a part of coating.



Examples of coating jig development

No choice of work or material

The indium mirror coating system does not select workpieces. Sizes range from medium to small. From mobile communication devices to home appliances and cosmetics parts. It supports a wide range of materials, including ABS, PC, glass, and stainless steel.

Examples of work and revolving jigs.

Image of Plating-like coating work pieces

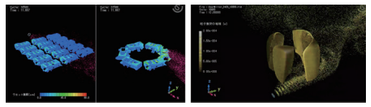
Standardization of "R-Technology"

Released from the heavy work of Spray-man. We have pursued efficient movement, which is a specialty of robots, and have developed a multi-thin film coating method while rotating the workpiece. And the new technology of revolving coating "R-Technology" was completed. We have achieved excellent finish of thin film coating, high productivity, small amount of paint used, and significant reduction of VOC. "R-Technology" that controls the peripheral equipment necessary for painting with advanced applications. We can solve quality, cost, and environmental problems at the same time.

R の技術 Revolving Coating.

Visualization of coating by fluid analysis

R-Technology visualizes and analyzes coating efficiency and coating time using fluid analysis technology. By quantifying the optimal conditions, we also demonstrate the superiority of revolving coating.



Fluid analysis

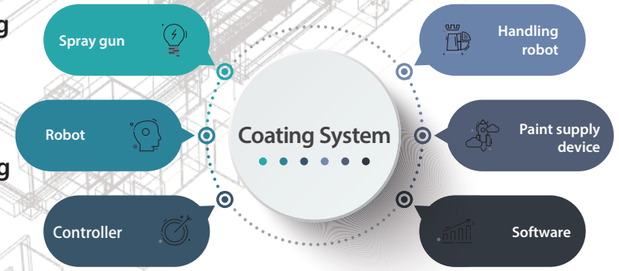
Image of Automatic coating system with 3-coat by 1-robot, SWAN-Pro

Coating system variations to meet production requirements

Indium mirror coating system realized in a systemized environment

Systematization of equipment necessary for coating

In the indium mirror coating system, everything from robots, automatic spray guns, conveying equipment, paint supply equipment, control panels, to booths and jigs is highly coordinated. A systematized and highly controlled environment makes the coating film an excellent product.



Requirements for realization of indium mirror coating

● Smoothing of substrate ● Coating equipment that enables uniform film thickness ● Dust-free coating environment ● Numerical controllable devices and systems ● Equipment that reduces wasted paint consumption ● Environmentally friendly production equipment

Coating robots for Indium Mirror Coating System

SWAN Pro

LINE DANCER W-turn 8Top

Clean room

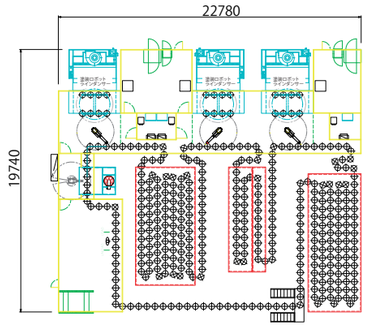
The great enemy of plating paint is defective garbage. The indium coating system is designed as a clean room system with a cleanliness level of class 10,000 to 100,000. We are trying to deal with garbage. We also design temperature control that affects the coating film.

Clean room photo for reference

System variation

There are four basic styles of indium mirror coating systems. It can be selected according to the product type and production volume.

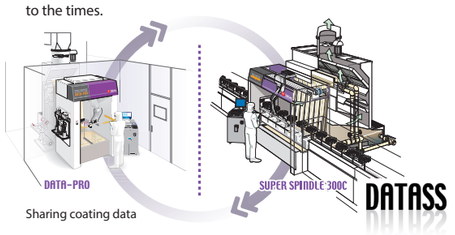
- *3R3C LINE DANCER 8-top Automatic coating system/Mass production*
- *3R3C SWAN-Pro Automatic coating system/Semi-mass production*
- *1R3C LINE DANCER 4-top Automatic coating system/Small quantity and High variety*
- *1R SWAN-Pro Batch-type coating system/Small-lot, High-mix production*



Reference drawing for 3R3C LINE DANCER 8-top Automatic coating system/Mass production

DX conversion of coating system

The indium mirror coating system promotes DX coating. We are aiming for a production system that corresponds to the times.



Sharing coating data

Stable production and avoidance of decentralized production risk

The problem among the plants located in various places is the "variation" in quality, cost and yield. By quantifying the coating conditions and sharing the coating data, you can achieve stable quality and improved yield by building the same coating environment. You can avoid the risks of decentralized production (But, this is not a guarantee of yield).

Image of global expansion

Specifications and coating performances for the Indium paint “ECO MIRROR 49”

MUSAHI Paint holdings co., ltd.

ECO MIRROR 49　Standard spray specifications　3C3B				
Terms		EC-NTM82-Line Under coat （Various colors）	EC-NTM59-Line Middle coat	EC-NTM62-Line Top coat （Various colors）
Mixing ratio Paint : Hardener : Thinner (by weight)		4:1:4±0.5	10:4±4	4:1:2.5±0.5
Spraying viscosity （IWATA VISCOMETER NK-2.20℃）		10±1sec	8±0.5sec	10±1sec
Spraying method		[R-technology] revolving coating technology dedicated		
Baking condition	Flash-off	25℃×1-5min.		
	Baking	80℃×20min.	80℃×5min.	80℃×20min.
Standard film thickness		15±2μm	Less than 1μm Transmittance inspection	15±2μm

Undercoat of EC-NTM82-Line is for general purpose plastic materials (ABS, PC/ABS, PC, PMMA). For light metals (Aluminum, Stainless steel, etc.), Super engineering plastics (PPSU, PPS, PEI, etc.) and Engineering plastics (Nylon, PBT, etc.), use　EC-NTM86-Line Undercoat.

Test item	Test conditions	Result
Adhesion	Peeling off 1mm cross cut + tape (10 × 10)	100/100
Hardness	Pencil scratch tester, Mitsubishi pencil UNI, 1kg load, scratch method	HB-F
Eraser abrasion resistance	Sony eraser testing equipment, 1.64kgf, 100 cycles	Pass
Alcohol resistance	99.5% ethanol rubbing, 500g/cm2, 100 cycles	Pass
Acid resistance	0.1N H2SO4, 5cc, 25 oC×24h,　No changes	Pass
Alkali resistance	0.1N NaOH, 5cc, 55 oC×4h,　No changes	Pass
Water resistance	Adhesion test after immersion in warm water 70 oC x 240h	100/100
Heat resistance	Adhesion test after leaving at 105 oC×500h	100/100
Moisture resistance	Adhesion test after 50 oC×95%RH×500h	100/100
Heat cycle resistance	Adhesion test after -20 oC×3h ↔60 oC×3h, 10 cycles	100/100
Salt spray resistance	Appearance check after salt spray 35°　C x 500h after cross-cutting	Pass
Painting condition	Substrate PC (Polycarbonate) Black ■Under coat　：EC-NTM82-1001 ECO MIRROR 49　Under black Paint：Hardener(Z-EC-H-490)：Thinner(Z-EC-K995)=4：1：4(by weight) Flash-off 25 oC×5min. Baking 80 oC×20min. DFT 15±1μm ■Middle coat　：EC-NTM59-1001 ECO MIRROR 49 Silver Paint：Thinner(Z-EC-K993)=10：4(by weight) Flash-off 25 oC×5min. Baking 80 oC×5min. ■Top coat　：EC-NTM62-1001X ECO MIRROR 49 Top clear Paint：Hardener(Z-EC-H-490)：Thinner(Z-EC-K993)=4：1：2.5(by weight) Flash-off 25 oC×5min. Baking 80 oC×20min. DFT 15±2μm (7 days before examination start)	

*The listed property value is not value of standard by our test result. Please adopt it after examining it enough
*Please note that product specifications are subject to change without notice due to improvements.

The Indium Mirror Coating System was developed jointly by MUSASHI Paint Holdings Co., Ltd. and TAKUBO Engineering Co., Ltd. We will guide you together with companies that have agreed to carry out promotional activities for this plating-like coating system, which integrates paint and equipment and is environmentally friendly. Planning, design, construction, and sales are handled by TAKUBO Engineering Co., Ltd.

カタログダウンロード

Regarding your inquiries, please call us, sales department of TAKUBO Engineering Co., Ltd. at Tel+81-475-50-0211, or visit our “Inquiry page” on our web site https://www.takubo.co.jp/

Insight & Innovation TAKUBO ENGINEERING CO.,LTD.

TAKUBO Engineering Co., Ltd.　タクボエンジニアリング株式会社
2-7 Okayamadai, Togane-shi, Chiba, 283-0826, Japan
Tel: +81-475-50-0211/Fax: +81-475-50-0231

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