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METASHINE

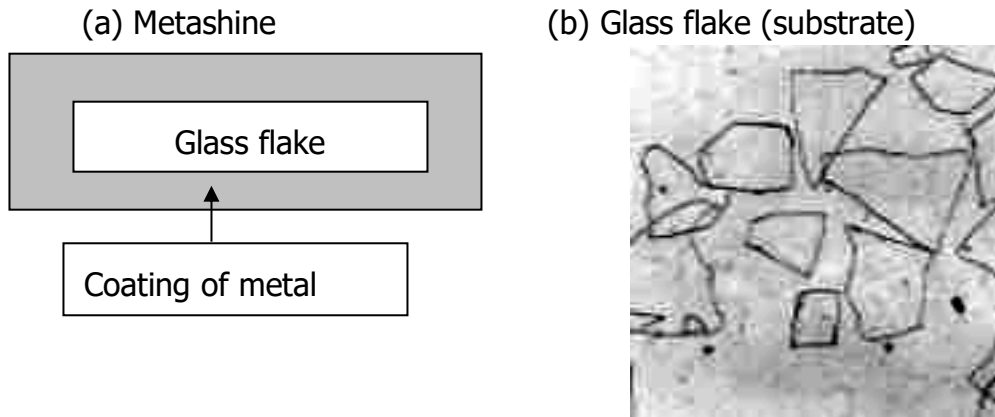
**METASHINE**  
***TECHNICAL REPORT***

**NIPPON SHEET GLASS CO., LTD.**

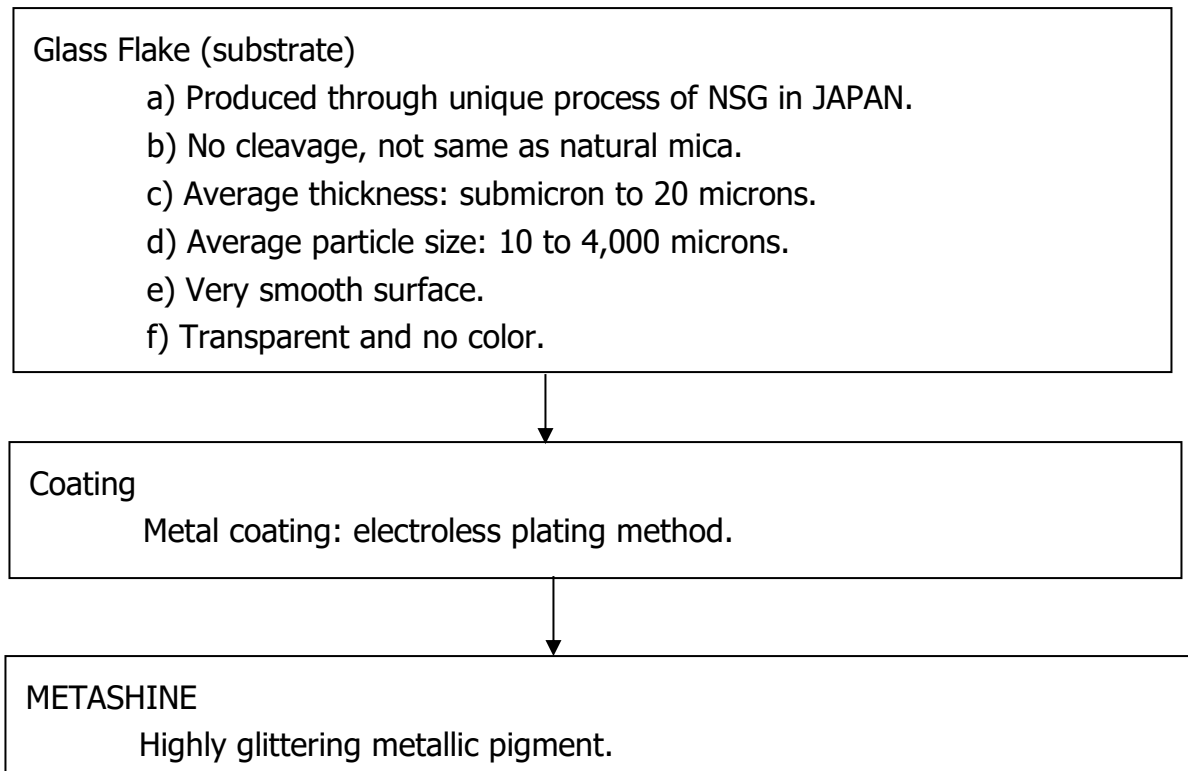
# 1. What is METASHINE?

“Microglas Metashine<sup>(R)</sup>” is a highly glittering metallic pigment consisting of metal coated glass flakes, which has been developed by NIPPON SHEET GLASS CO.,LTD.

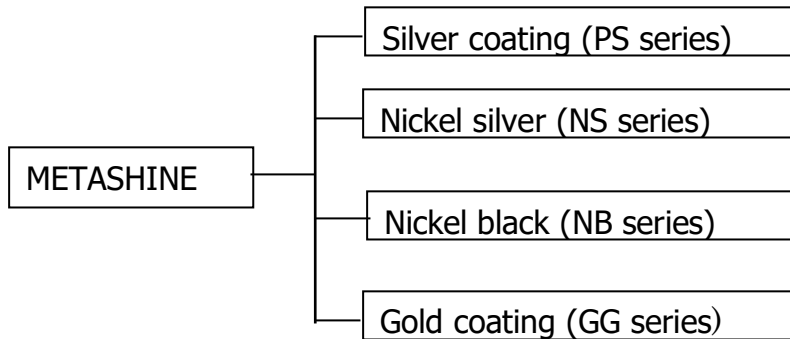
## 1-1. Schematic profile of METASHINE



## 1-2. Flow chart of Metashine production and each characteristic



## 2. TYPE of METASHINE



## 3. CHARACTERISTICS OF METASHINE

### 3-1. Property of Glass flake (substrate)

#### (a)Composition of Glass flake

Components	E-glass	C-glass
SiO <sub>2</sub>	52-56	65-72
Al <sub>2</sub> O <sub>3</sub>	12-16	1- 7
CaO	16-25	4-11
MgO	0- 6	0- 5
B <sub>2</sub> O <sub>3</sub>	5-13	0- 8
Na <sub>2</sub> O+K <sub>2</sub> O	0-0.8	9-17
ZnO	-	0- 6

#### (b)Property of Glass flake

	E-glass	C-glass
Specific gravity	2.54	2.49
Mohs' hardness	6.5	6.5
Refraction Index	1.549	1.541
Young Modulus	73GPa	69GPa
Elongation at break	4.8%	4.8%
Softening point	840 C	750 C

3-2. Property of Metashine

	Silver series		Nickel series	
	5 micron type	1 micron type	NS	NB
Substrate glass	C-glass	E-glass	C-glass	
Specific Gravity	approx.3	approx.3	approx.3	
Color	white silver	yellowish silver	nickel silver	nickel black
Plated metal	silver		nickel	
Plating thickness	approx. 0.05 microns		approx.0.15 microns	
Plating method	electroless plating		electroless plating	
Heat resistance	1 hour at 200 C		1 hour at 250-300 C	
Weatherability	Sunshine Weather Test: no change after 1000 hour exposure to UV radiation (Metashine is mixed in a clear paint film).			
Chemical resistance	see table 3-5		resistant to chemicals except for strong acids, same as metal nickel	

3-3. Characteristics of Metashine

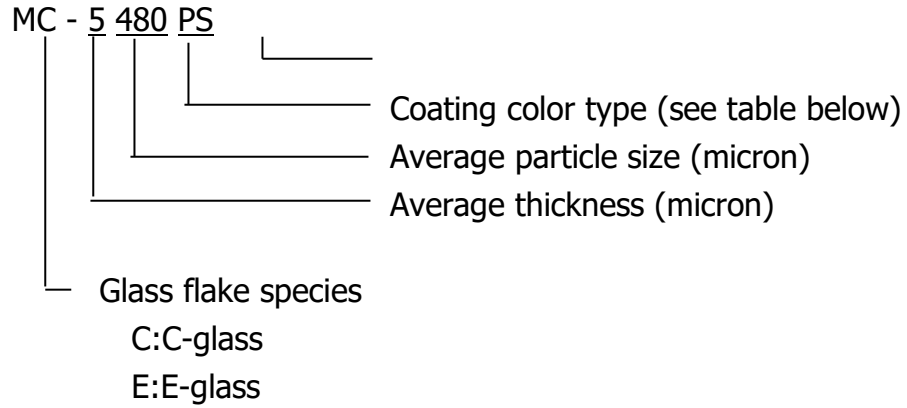
- (1) High reflection of visible light is realized with smoothness and uniformity of plated metal surface.
- (2) Metashine is randomly oriented in the matrix, and it dispersed easily and uniformly.
- (3) Due to the lower specific gravity of Metashine compared with other metallic flakes and powders, its dispersion and processability is better.
- (4) Metashine has the excellent physical properties of the substrate, glass flakes, which prevent molded parts from shrinking and warping as well as reducing the apparent permeation rate of water or any other liquid into the parts.

**3-4. Chemical resistance of Metashine PS series**

(1) Water	Hot water (60 C)	No change	24 hours immersion
	Salt water (5% )	No change	
(2) Detergents	Toilet soap	No change	24 hours immersion
	Washing soap	No change	
	Kitchen soap	No change	
	Soda acetate solution (saturated)	No change	
(3) Organic solvents	Benzene	No change	24 hours immersion
	Toluene	No change	
	Methyl ethyl ketone	No change	
	Ethyl acetate	No change	
	Kerosene	No change	
	Methanol	No change	
	Trichlene	No change	
	Paint thinner	No change	
	Tetrachloroethylene	No change	
(4) Oils	Petrol	No change	24 hours immersion
	Engine oil	No change	
	Coolant	No change	
	Wax	No change	
(5) Reagents	Sulfuric acid (5%)	No change	24 hours contact with drop of the reagent
	Sulfuric acid (95%)	No change	
	Nitric acid (61%)	Dissolved	
	Hydrochloric acid (20%)	No change	
	Hydrochloric acid (35%)	No change	
	Aqua regia	Dissolved	
	Chromic acid mixture	Dissolved	
	Sodium hydroxide (5%)	No change	
	Sodium hydroxide (30%)	No change	
	Ammonia solution (25%)	No change	
	Acetic acid (99%)	No change	
Formaldehyde solution (35%)	No change		
(6) Gas	Ammonium sulfide gas (0.2%)	Faint yellow	24 hours exposure
	hydrogen sulfide gas	Slight yellow	

**4. Metashine Series, Standard Products**

4-1. Product Code



Coating type	Code	Color
Metal Coating	PS	Silver
	NS	Nickel silver
	NB	Nickel Black
	GG	Gold

4-2. Code of various series type

MC5090PSS1	MC1020NB
MC5150PSS1	MC1040NB
MC5230PSS1	MC1080NB
MC5480PSS1	MC5030NB
	MC5090NB
ME2025PSS1	MC5150NB
ME2040PSS1	MC5230NB
	MC5480NB
MC5090PSS2	
MC5030NS	MC2040GP
MC5090NS	MC2080GP
MC5140NS	
MC5150NS	
MC5230NS	
MC5480NS	

## 5. CAUTION

### 5-1. Emergency and first aid procedures

Eye(s) contact: Flush with clear water for at least 15 minutes. Seek medical attention for prolonged pain.

Skin contact: Do not rub. Rinse contacted areas with room temperature to cool water, then wash gently with mild soap. Taking a bath is effective for removing Metashine.

Inhalation: Gargle with clear water at least 10 times. Lightly blow nose. Seek medical attention for prolonged pain or irritation.

Swallowing: Spit out and rinse mouth with water. Obtain medical assistance as required.

### 5-2. Fire fighting procedures

Extinguish method: Usual fire fighting

Extinguish media: Water, carbonic acid gas, foam, dry chemicals and powder are all effective with Metashine. Choose appropriate media depending on the environment.

Others: Metashine is not flammable.

### 5-3. Spill and leak procedures

If material is released or spilled, sweep or vacuum up quietly so as not to be scattered. Throw it away as general industrial waste.

### 5-4. Handling and storage

Handling: Prevent inhalation or contact with eyes or skin. Wear appropriate glove, eye protection, and respiratory protection.

Storage: Store Metashine indoor. Avoid direct sunshine, hot temperature, and high humidity.

### 5-5. Exposure controls and personal protection

Ventilation: Mechanical, general, or local exhaust may be required in some operations.

#### Personal Protection

Respiratory protection: Recommended

Eye protection: Safety glasses with side shields are recommended.

Hand protection: Wear gloves.

Skin protection: Wear long sleeved shirts, tight at the neck and wrists, and long pants, tight at ankles.