

FINE POWDERS

CONDUCTIVE PASTES

RESISTIVE PASTES

DIELECTRIC PASTES

**Fine Powders and Thick Film Materials**

# I N D E X

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## Materials

<b>1 Fine Powders (Precious Metal)</b>	
Silver, Platinum, Ruthenium(IV) Oxide .....	2
Palladium, Silver/Palladium (Coprecipitated and Alloy) .....	2
<b>2 Fine Powders (Base Metal)</b>	
Nickel, Copper .....	3
<b>3 Conductive Compositions</b>	
3-1 Silver Compositions (Fired-on type) .....	4
3-2 Silver Compositions (Heat curing type) .....	4
3-3 Gold Compositions .....	4
3-4 Silver/Platinum Compositions .....	5
3-5 Silver/Palladium Compositions .....	5
3-6 Palladium Compositions .....	5
3-7 Platinum Compositions .....	5
3-8 Copper Compositions (For Nitrogen firable) .....	6
3-9 Copper Compositions (Heat curing type) .....	6
3-10 Nickel Compositions (For H <sub>2</sub> -N <sub>2</sub> firable) .....	6
<b>4 Dielectric Compositions .....</b>	<b>6</b>
<b>5 Resistive Compositions .....</b>	<b>7,8</b>

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SHOEI, founded in 1956, is a recognized supplier of reliable thick film materials for the electronics industry. Originally successful in supplying ceramic capacitors, our product offering has expanded to include other conductive, resistive and dielectric compositions, along with electronic grade powders to serve emerging electronic technologies.

Since the 1960s, Shoei's compositions have shown a proven performance in traditional hybrid circuitry, and now as key constituents in evolving interconnect applications. Our products are integral to the production of surface mount components, providing reliable and cost-effective solutions to volume process applications.

We supply a variety of quality thick film compositions, and are recognized for our fine precious metal powders, of which more than ten metric tons monthly are provided around the world. Lot-to-lot consistency and "just in time" delivery are just a few of the reasons why Shoei is the materials supplier of choice. We provide quick, in-depth technical support by utilizing state-of-the-art thick film processing and inspection equipment. Our large number of R&D engineering staff proactively respond to our customer's current and future needs to ensure Shoei will meet the demands of this rapidly changing industry in the 21st Century.

In the following pages, you will find an idea of our products that meet most needs. We look forward to serving you, and encourage you to contact your Shoei representative to learn how we can meet your needs.

# Materials

## 1. Fine Powders (Precious Metal)

Product No.	Content	Shape	Surface Area	Tap Density
Ag-008	Ag	Microcrystalline	3.3 (m <sup>2</sup> /g)	1.9 (g/cm <sup>3</sup> )
Ag-030	Ag	Microcrystalline	4.0	1.7
Ag-107	Ag	Spherical	0.9	2.2
Ag-119	Ag	Microcrystalline	1.0	1.9
Ag-128	Ag	Spherical	0.5	4.5
Ag-530	Ag	Flake	1.1	2.6
Ag-531	Ag	Flake	1.9	—
Ag-532	Ag	Flake	1.5	1.9
Ag-540	Ag	Flake	0.8	3.6
Ag-201	Ag	Spherical; Highly Crystalline	6.5	3.5
Ag-202	Ag	Spherical; Highly Crystalline	2.2	4.1
Ag-204	Ag	Spherical; Highly Crystalline	1.2	4.4
Ag-208	Ag	Spherical; Highly Crystalline	0.6	4.4

Ag-522	Ag-Bi <sub>2</sub> O <sub>3</sub> -C	Flake	1.9	2.1
Ag-838	Ag-Bi <sub>2</sub> O <sub>3</sub>	Microcrystalline	0.8	1.8

Pd-209	Pd	Microcrystalline	1.2	2.1
Pd-215A	Pd	Spherical	1.0	5.2
Pd-222	Pd	Monocrystalline	0.9	4.5
Pd-225	Pd	Monocrystalline	1.0	5.0

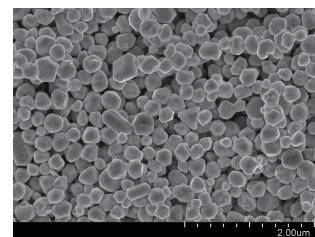
Pd-610A	AgPd	Spherical	1.9	3.9
Pd-615A	AgPd	Spherical	1.9	3.9
Pd-620A	AgPd	Spherical	2.0	3.9
Pd-630A	AgPd	Spherical	2.2	4.0
Pd-670A	AgPd	Spherical	2.0	4.4

Pd-710	AgPd	Monocrystalline	0.7	2.7
Pd-720	AgPd	Monocrystalline	0.9	3.0
Pd-730	AgPd	Monocrystalline	0.8	3.5
Pd-770	AgPd	Monocrystalline	0.8	4.0

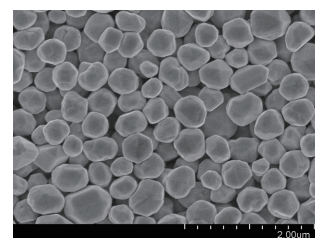
Pt-401	Pt	Microcrystalline	0.4	2.8
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Ru-109G	RuO <sub>2</sub>	Microcrystalline	15.0	1.3
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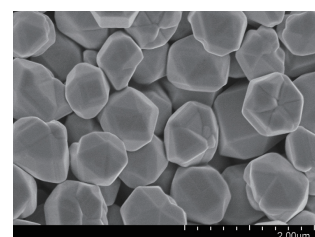
## SEM PHOTO



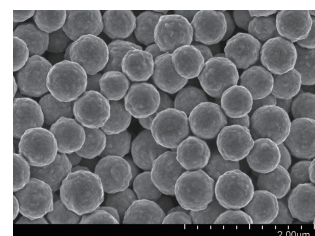
Ag-202



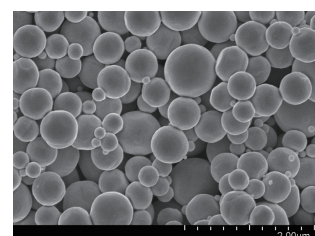
Ag-204



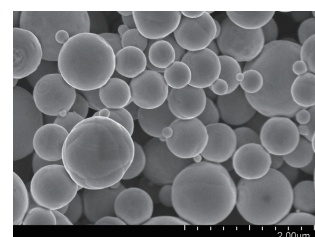
Ag-208



Pd-215A



Pd-225



Pd-730

# Materials

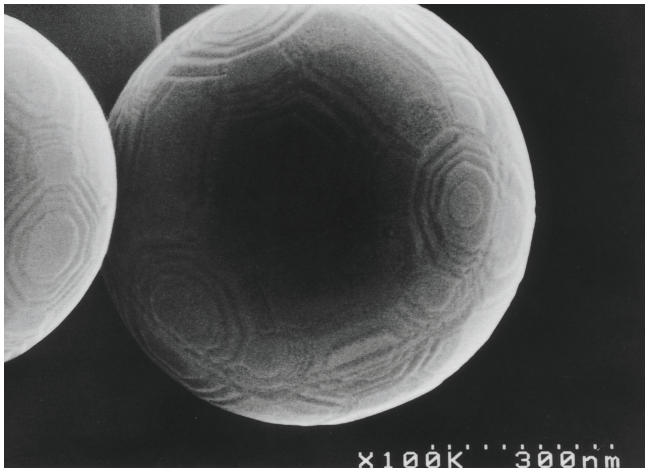
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## 2. Fine Powders (Base Metal)

Product No.	Content	Shape	Surface Area	Tap Density
Ni-683	Ni	Monocrystalline	4.7 (m <sup>2</sup> /g)	2.5 (g/cm <sup>3</sup> )
Ni-670	Ni	Monocrystalline	3.4	2.5
Ni-660	Ni	Monocrystalline	2.4	3.0
Ni-640	Ni	Monocrystalline	1.2	3.9

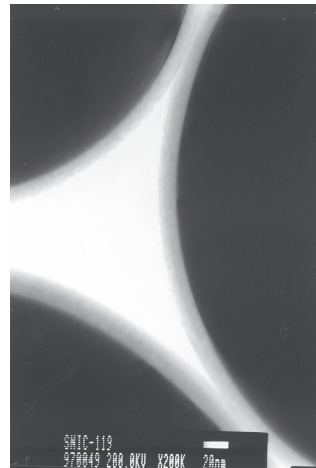
Cu-505	Glass-Cu	Spherical	0.8	3.2
Cu-105	Cu	Spherical	1.3	3.3

### Glass-coated Copper Powder

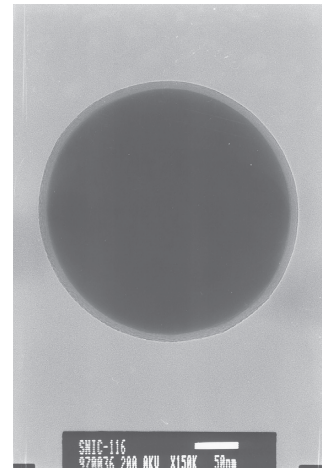


SEM PHOTO

Pd-222 (Monocrystalline)



TEM PHOTO



Cu-505

# Materials

## 3. Conductive Compositions

### 3-1 Silver Compositions (Fired-on type)

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
H-1004	Varistors	Brushing, Spraying	700	Good spray printability; good bondability with materials resistant to SnO <sub>2</sub>
H-2104	MLCC Termination	Dipping	700-800	For TC; good shape; good platability
H-2109	Laminated Component Termination	Dipping	700-800	Good platability & adhesion
H-2117H	Laminated Component Termination	Dipping	600-700	Good platability & adhesion
H-2122	Laminated Component Termination	Dipping	600-700	Advantage in cost; good adhesion
H-2942	MLCC Termination	Dipping	600-700	For low firable ceramics, good platability
H-2943	Overcoat Correction for MLCC Termination	Dipping	600-700	Use for overcoat; improved soldering, simultaneous firing possible
H-2954H	Laminated Component Termination	Dipping	600-800	For HiK and TC; good platability; good bending strength
H-2955N	Laminated Component Termination	Dipping	700-800	For HiK and TC; good platability; good adhesion
H-2997	MLCC Termination	Dipping	700-800	For HiK F; good shape; good platability
H-4040A	Display Devices, PZT, Ceramic Capacitors	Screen	550-800	Applicable to large substrates; good line resolution
H-4207	CR 1st Conductors	Screen	850	Compatible with resistors; good line resolution
H-4209	Resonators	Screen	850	Good line resolution; good printability, Pd-free design
H-4215	Hybrid IC	Screen	850	Pb free; good adhesion; good line resolution
H-4510	PZT Buzzers, PZT Filters	Screen	700	For general PZT products; good adhesion strength
H-4563	PZT, Ceramic Capacitors	Screen	700-800	For thin ceramic substrates
H-4566	CR 1st Conductors	Screen	850	Compatible with resistors; good line resolution
H-4722	PZT Buzzers	Screen	700	Platability; good solderability
H-4767	Ceramic Capacitors	Screen	800	High-pressure; good solder leach resistance
H-5698	Ceramic Capacitors, PZT, Resonators	Screen	700-800	General for various ceramics; suitable for thicker prints; good resistance to soldering heat
H-5993	Resonators	Screen	850	Good solder leach resistance; excellent Q characteristics
H-5997	Hybrid IC	Screen	850	Good adhesion; good line resolution; applicable to enamel substrates
ML-4019	Inner Electrodes for Chip Inductors	Screen	900	Low Rdc; good line resolution; dielectric system
ML-4019L	Inner Electrodes for Chip Inductors	Screen	900	Low Rdc; thin print; dielectric system
ML-4038L	Inner Electrodes for Chip Inductors	Screen	900	Low Rdc; good line resolution; dielectric system
ML-4062	Inner Electrodes for Chip Inductors	Screen	900	Slow sintering; dielectric system

### 3-2 Silver Compositions (Heat curing type)

Product No.	Application	Printing Method	Curing Conditions	Resistivity (Ω·cm)	Key Features
N-2057A	Printed Wiring Boards	Screen	160°C, 30min	<1.5×10 <sup>-4</sup>	Low cost, low resistance, phenol
N-4761	Polarizer for PZT	Screen	100°C, 10min	<1.5×10 <sup>-4</sup>	Removable after polarization

### 3-3 Gold Compositions

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
Au-4405A	Hybrid IC	Screen	850	Good die bondability; good semiconductority
Au-4460	Hybrid IC	Screen	850	Good die bondability; good line resolution

# Materials

## 3-4 Silver/Platinum Compositions

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
D-4022	Hybrid IC, Variable Resistors	Screen	850	Good adhesion; good solderability

## 3-5 Silver/Palladium Compositions

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
D-2856	MLCC Termination	Dipping	800	Good adhesion; for solder reflow
D-2864	Termination for Chip Inductors	Dipping	650	Good platability; good contact with inner electrodes
D-4302	Hybrid IC, Variable Resistors	Screen	760-800	Good compatibility with various resistors
D-4344	Hybrid IC, Resistor Networks	Screen	850	Good solder leach resistance and good silver migration (moisture) resistance
D-4397N	Resistor Networks	Screen	850	Good compatibility with various resistors; less stain phenomenon
D-4436	Hybrid IC	Screen	850	Excellent resistance to soldering heat, good printability, Pd-free design
D-4437	1st conductor for CR	Screen	850	Good compatibility with various resistors; good platability; low cost
D-4438	1st conductor for CR	Screen	850	Good solder leach resistance; lowcost; Pd-free design
D-4697	Chip Array Resistors	Screen	850	Good through-hole coverage; low cost
D-4696K	Chip Array Resistors	Screen	850	Good through-hole, prevention of diffusion of Ag for low cost
D-5670	Hybrid IC, Variable Resistors, Resistor Networks	Screen	850	Good aged adhesion; good line resolution; fast firable; low cost
ML-3901	MLCV Inner Electrode	Screen	950-1150	Little reaction with ceramics; high reliability; low cost
ML-3907	MLCV Inner Electrode	Screen	950-1150	Little reaction with ceramics; high reliability; low cost
ML-3936N	MLCC Inner Electrode	Screen	900-1080	For HiK with PVB sheets; small oxidation expansion
ML-3952	MLCC Inner Electrode	Screen	900-1080	For TC and HiK with PVB sheets; small oxidation expansion
ML-3970	MLCC Inner Electrode	Screen	850-930	For HiK with PVB sheets; small oxidation expansion
ML-3026	MLCC Inner Electrode	Screen	950-1100	Little reaction with ceramics; low cost
ML-3900srs	MLCV Inner Electrode	Screen	850-1200	Designed to custom specifications

## 3-6 Palladium Compositions

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
ML-3737	MLCC Inner Electrode	Screen	1280-1400	Applicable to PVA and PVB sheets
ML-3700srs	MLCC Inner Electrode	Screen	1280-1400	Designed to custom specifications

## 3-7 Platinum Compositions

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
ML-3822	Varistors & PZT Transducers Inner Electrode	Screen	1100-1450	Little reaction with ceramics; for PVB sheets; high reliability

# Materials

## 3-8 Copper Compositions (For Nitrogen firable)

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
SC-4060	Anti-surge resistors	Screen	900	Good solder leach resistance; good line resolution
C-4110H	MLCC Termination	Dipping	900	Good contact with nickel inner electrode; good bending strength
C-4118	MLCC Termination	Dipping	900	Good contact with nickel inner electrodes
C-4146	MLCC Termination	Dipping	800	Good shape; Prevent solder spattering
C-4178	MLCC Termination	Dipping	780	Good shape; Prevent solder spattering
C-4000srs	MLCC Termination	Dipping	—	Designed to custom specification

## 3-9 Copper Compositions (Dried-on type)

Product No.	Application	Printing Method	Curing Conditions	Key Features
C-4100srs	Jumper Wire	Screen	180°C, 30min	Designed to custom specifications

## 3-10 Nickel Compositions (For H<sub>2</sub>-N<sub>2</sub> firable)

Product No.	Application	Printing Method	Firing Temp.(°C)	Key Features
ML-9612	MLCC Inner Electrode	Screen	1100-1300	For B characteristic; applicable for high stacking
ML-9657	MLCC Inner Electrode	Screen	1100-1300	For B/F characteristic, applicable for high stacking
ML-9664	MLCC Inner Electrode	Screen	1100-1300	For temperature compensation
ML-9000srs	MLCC Inner Electrode	Screen	1100-1300	Design customized product with various Ni powders

## 4. Dielectric Compositions

Product No.	Application	Printing Method	Firing Temp.(°C)	Color	Key Features
G-5177	Overcoat	Screen	520	Green	Easy to laser trim; good moisture protection
G-5204	Display Devices	Screen	550	Black	For thicker print; good print resolution
G-5231L	2nd overcoat for CR	Screen	600	Black	Good resistance to plating solution; less resistivity change
G-5238	1st overcoat for CR	Screen	600	Green	Easy to laser trim; good line resolution
G-5258T	1st overcoat for CR	Screen	600	Green	Easy to laser trim
G-5270G	1st overcoat for CR	Screen	600	Green	Easy to laser trim
G-5276	2nd overcoat for CR	Screen	600	Auburn	Improved withstand voltage characteristics, various colors available

# Materials

## 5. Resistive Compositions

Printing Method : Screen

Series	R-2000	R-2000L	R-9000N	
Application	CR R Networks	CR R Networks	Hybrid IC R Networks	
Firing (°C)	850	850	850	
TCR (ppm/°C)	<±50	<±100	<±100	
Key Feature	High reliability, current noise Low TCR	High reliability & Low TCR	High reliability, fast firing, ESD	
Resistivity ( $\Omega$ / □)	0.1	*R-2001	*R-2001L <sup>#</sup>	
	0.4			
	1.0	**R-2010	R-2010L <sup>#</sup>	
	1.5			
	3.0			
	4.0	***R-2040	R-2040L	
	5.0			
	10	R-2110	R-2110L	R-9110NC
	15			
	40	R-2140		
	100	R-2210		R-9210NC
	400			
	1k	R-2310		R-9310N
	4k			
	10k	R-2410		R-9410N
	40k			
	100k	R-2510		R-9510N
	400k			
	1M	R-2610		R-9610N
10M	R-2710		*R-9710N	
40M	R-2740			
Resistor W×L (mm)	1×1	1×1 1×56 <sup>#</sup>	1×2	
Remarks) TCR	*1000 **<±350 ***<±100	*<±150	*<±200	
Recommended Conductors	D-4697 (99.5Ag/0.5Pd) H-4566 (Ag) D-4437 (99.5Ag/0.5Pd)	D-4696K (98Ag/2Pd) H-4566 (Ag) D-4437 (99.5Ag/0.5Pd)	D-4344 (73Ag/27Pd) D-5670 (85Ag/15Pd) D-4022 (99Ag/1Pt)	



# Materials

## 5. Resistive Compositions

Printing Method : Screen

Series		R-9000A	R-4000
Application		Variable resistors, potentiometers	Potentiometers
Firing (°C)		850	850
TCR (ppm/°C)		<±100	<±100
Key Feature		High reliability for stainless wipers	Palladium-silver multi-wiper
Resistivity (Ω/□)	1.5	R-9010A	R-4010 <sup>#</sup>
	5.0	R-9050A	R-4050 <sup>##</sup>
	10.0	R-9110AC	R-4110
	100.0	R-9210A	R-4210
	1k	R-9310A	R-4310
	10k	R-9410A	R-4410
	100k	R-9510A	R-4510
	300k		
	1M	R-9610A	
	3M		
10M			
Resistor W×L (mm)		1×2 TCR:2×20	1×9
Remarks) TCR			
Recommended Conductors		D-4302 (70Ag/30Pd) D-5670 (85Ag/15Pd) D-4691 (98Ag/2Pd) D-4022 (99Ag/1Pt)	D-5670 (85Ag/15Pd)  # 0.8Ω/□ ## 7Ω/□

Product No.	Application	Resistivity	Firing Temp.(°C)	Key Features
SR-7040	Anti-surge resistors	40-50mΩ/□	900	Nitrogen fireable; TCR<±100ppm/°C