

DSAM Material Introduction



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1. Company History

1980

Founded
Daesung Metal

1990

Factory 1
(Incheon)



1990

Silver business
Metal recycling
manufacture

2003

Sputtering target
manufacture



2009

Factory 2
(Incheon)

Precious metal material
manufacture



2010~2012

Accessories business

Non-ferrous metal
Sputtering target
manufacture



2014

Komsco Enrollment

KRX GOLD manufacture



2021

Headquarters expansion
(Incheon, South Korea)



2020~

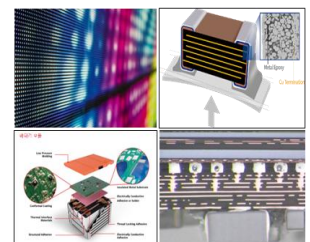
R&D Center

Electronic material development

- . Cu-Graphene Powder & Paste/Ink
- . Ag-Cu-Gr Paste & Ag Paste/Powder
- . Solder Paste & Flux
- . Epoxy Solder Paste
- . Non-Clean Flux Ver.01
- . High-temperature Electrode Paste

2025~

- . Cu-Graphene Sintering Paste
- . Ag Chip bonding Paste
- . Micro Ball Flux
- . Fine Solder Paste
- . Ag Nano Powder <100nm

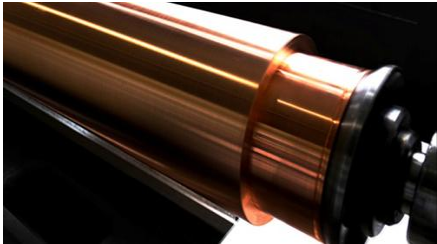
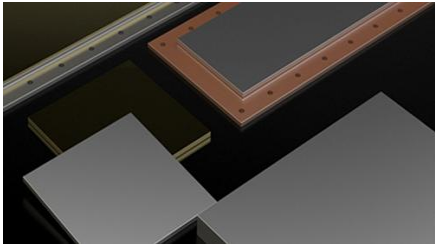


2. Product line-up

※ Sputtering Target

Material	Purity	G/S	Material	Purity	G/S	Material	Purity	G/S
Ag	4N5	<50μm	Ni-Cr (80:20wt%)	3N5	<30μm	Cu	4N8	<100μm
Au	4N	<80μm				Al	5N/4N	
Pd	3N5	<50μm	Ni-V (93:7wt%)	3N5	<30μm	Ni	4N	
						Ti	4N5	
			Ni-Cu (Monel)	4N		Al-1%Si	5N	<100μm
						Al-0.8%Si	5N	<100μm

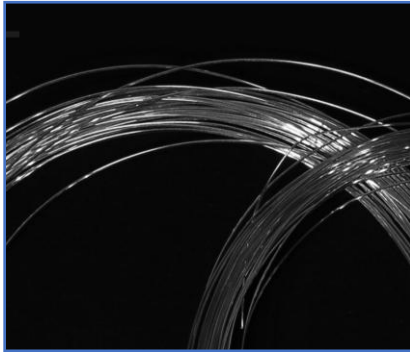
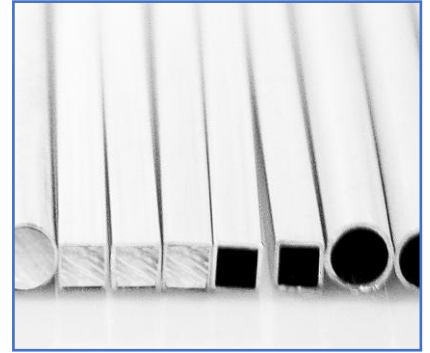
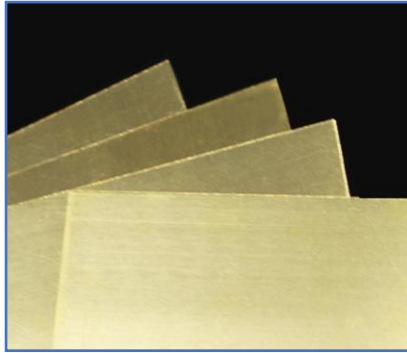
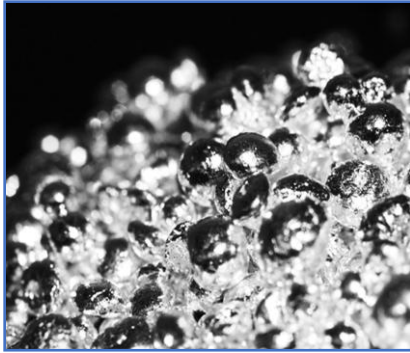
Cu Cylinder target



※ Silver / Gold Bar, Coin



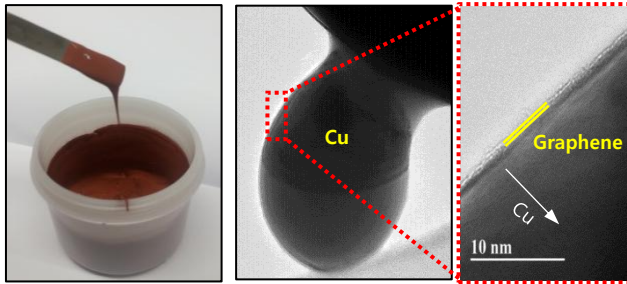
※ Ag & Au Product



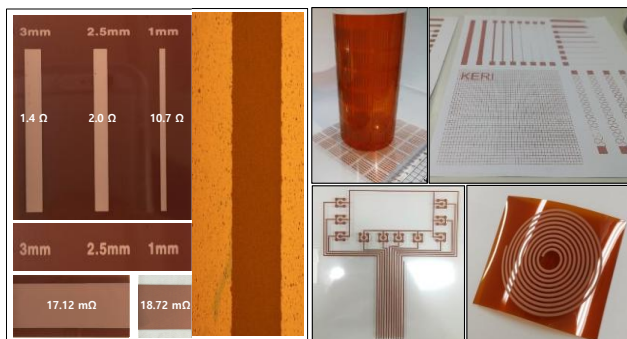
※ Plating material



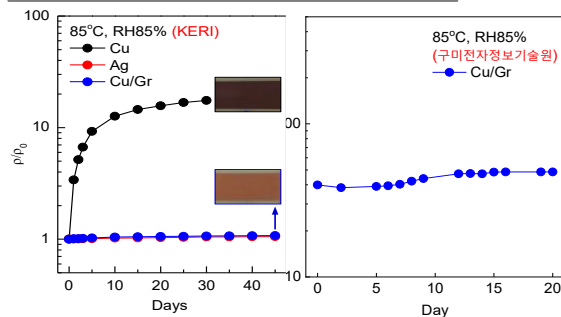
3. Cu-Graphene Paste/Powder



Specific resistance



Temperature/Humidity test (85°C, 85%)



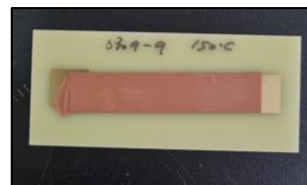
Cu-Graphene Paste

-. Particle Size

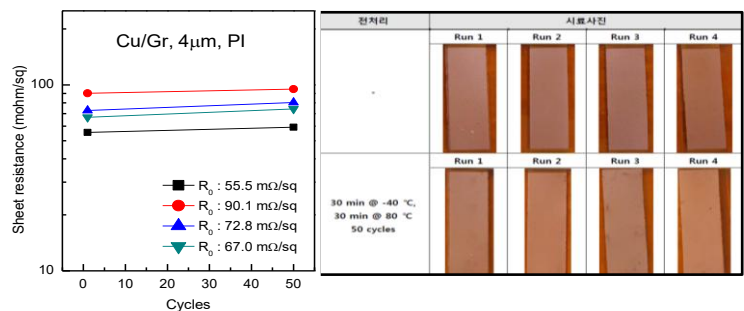
ITEM	Size	
	1.5μm	400nm
Vacumm N2 Oven	200°C 1hr	200°C 1hr
N2 Reflow	180°C 5min 250°C 20min	180°C 5min 230°C 20min

Air Oven Type (Metal & Silk Mask)

Cu-Graphene Paste



Thermal shock test (-40oC/30min~+80oC/30min,50 cycle)

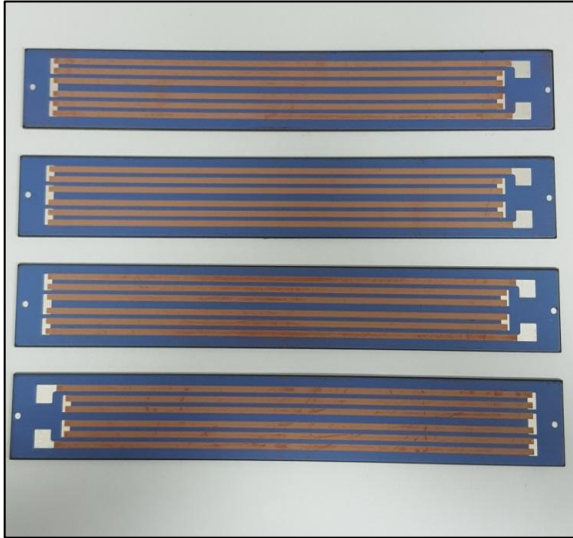


Product name	Particle Size	Specific resistance	Viscosity (cps)
DSAM-CG Series	1.5μm	3 mΩ.cm ↓	10,000~100,000
	400nm	3 mΩ.cm ↓	10,000~100,000
	1.5μm,400nm Hybrid	3 mΩ.cm ↓	10,000~100,000

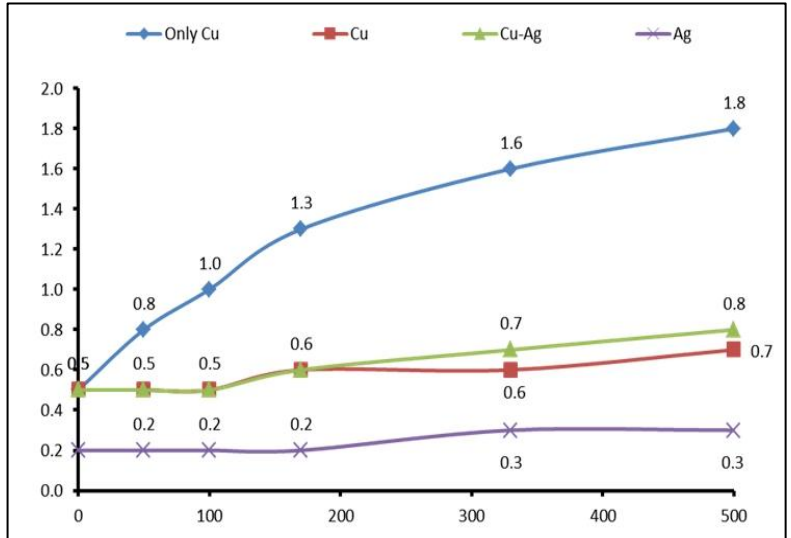
Application

Field	Purpose	Substrate	Advantage
Display Electrode	Ag → Cu-Graphene	Glass / Film	Low Cost
Touch panel	Ag → Cu-Graphene	PET / CPI / PI Film	Low Cost / High Flexible
Via Filling	Cu → Cu-Graphene	PCB / FPCB	Anti oxidation
Thick film heater	Ag, Pd → Cu-Graphene	SUS	Anti oxidation / High Fever

Application field



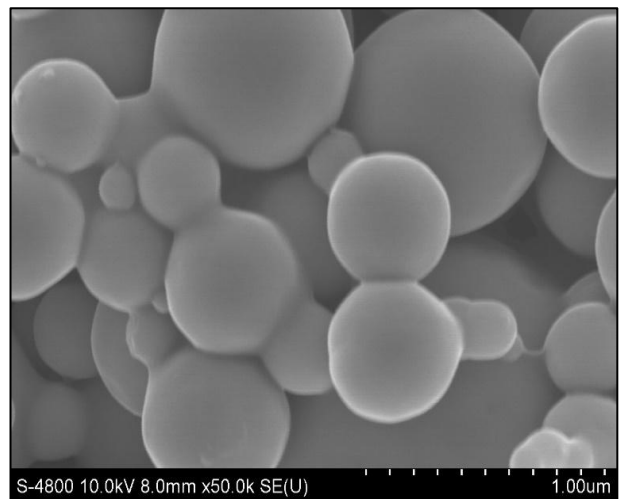
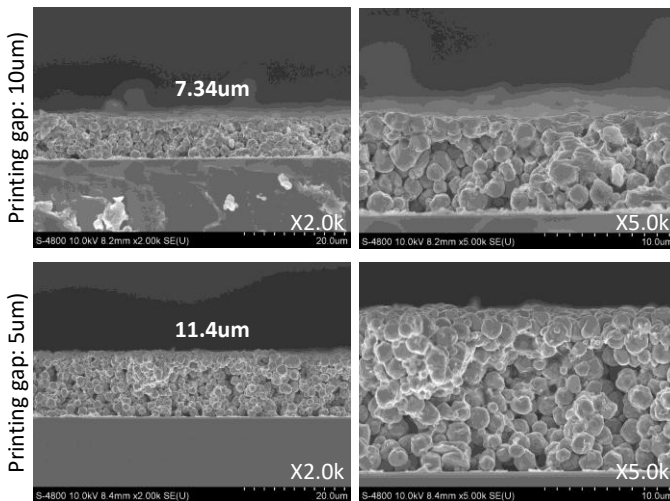
Reliability evaluation result



1. PTC heater (EV)
2. Pattern printing
3. Solar electrode circuit
4. Heat dissipation material
5. Via filling

※ Cu-Graphene has the same reliability as Ag.

SEM Image



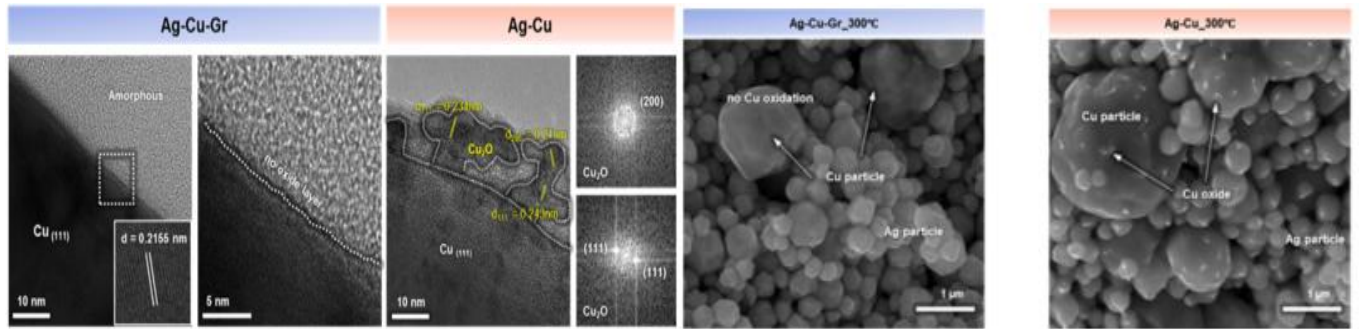
- Binder Type

1. Epoxy : Via filling / Heat dissipation material
2. Polyester : Flexible Film
3. Acryl : Pattern printing / Pattern printing Etc.

4. Sintering Paste & Electrode Paste



Ag-Graphene Paste Migration Test Result



Product name	Particle Size	Specific resistance (200°C)	Viscosity (cps)
DSAM-AG Series	Ag Micro+Nano	1 mΩ.cm ↓	10,000~100,000
	Ag Micro	1 mΩ.cm ↓	10,000~100,000
DSAM-CG Series	Cu Micro+Nano	5~10 mΩ.cm ↓	10,000~100,000
	Cu Nano	3~5 mΩ.cm ↓	10,000~100,000

Application

Field	Purpose	Substrate	Advantage
Display Electrode	Ag → Ag Nano	Glass / Film	Low Resistance
Touch panel	Ag → Ag-Cu-Graphene	PET / CPI / PI Film	Low Cost / High Flexible
LED Bonding	Ag → Ag-Cu-Graphene	PCB / FPCB	Low Cost / High Adhesiveness
Thick film heater	Ag, Pd → Ag-Cu-Graphene	SUS	Low Cost / High Fever

Ag Paste & Cu-Graphene Paste

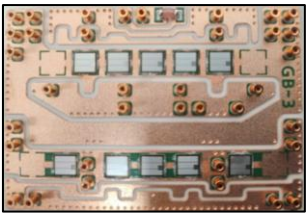
ITEM	Ag Paste	Cu-Gr Paste
	Particle Size	
	1~10 um	0.6~0.8 um
Printable Thickness	5~50μm	5μm ↓
Heating Oven	Low Temp.100~200 High Temp. 250~700°C 30~90min (Customized)	
Air Condition	Air/N2	N2

- . Printing Type
→ Etc. (Customizing)
- . Sintering Type : Heating, Light sintering
- . Low Temp. Type : 100~200°C
- . TGA : Sintering Ag or ACH Paste Hume : 10% ↓
- . bonding Type Adhesive Epoxy Type : 10.8 W/mk

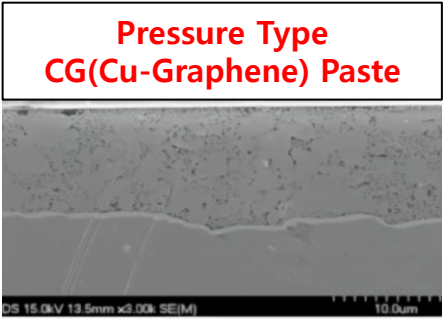
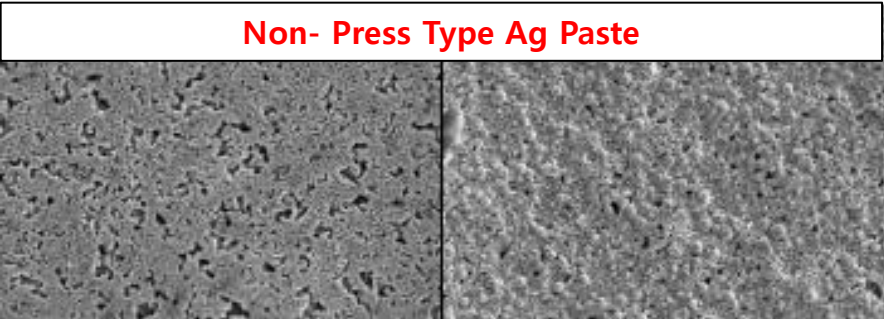
→ DSAM-AG/CG Sintering Paste Series

Introduction

DSAM-AG/ACH/CG products are adhesive materials composed of silver (Ag) or copper-graphene particles, in the form of a paste used for chip bonding and die bonding. They possess high sintering performance, excellent adhesion, and heat dissipation characteristics, and can be used in both non-pressure and pressure processes



Item	Unit	DSAM-AG	DSAM-CG (Cu-Graphene)
Viscosity(Pa.s)	Pa.s	70±5	50±5
Thixotropic Index(0.5/5rpm)		9	3±0.5
Viscosity Recovery rate	%	Below 10	Below 10
Thermal conductivity (250℃ 120min Non-Pressure)	W/mk	200~250	N2/Vac.
Thermal conductivity (280~300℃ 5min Pressure)	W/mk	250 ↑	150~180
Thermal conductivity (200~210℃ 60min Non Pressure)	W/mk	200~210	-
TGA (250℃ 30min)	%	90~95%	80~84%
Color		Silver	Brown
Resistivity (210℃ 60min Non-Pressure)	Ω·cm	4.0*10-6	-



AG	Temperature	Model	Diffusivity	Conductivity	Cp	Pulse type	
	°C		mm^2/s	W/(m^2K)	J/g/K		
	1	25.2	In-plane, i., heatl.	111.398	233.093	0.263	3 (long)
	2	25.0	In-plane, i., heatl.	111.112	232.495	0.263	3 (long)
	4	25.0	In-plane, i., heatl.	110.341	230.880	0.263	3 (long)
	7	25.1	In-plane, i., heatl.	111.316	232.921	0.263	3 (long)
	9	24.9	In-plane, i., heatl.	111.169	232.612	0.263	3 (long)
Mean:	25.0		111.067	232.400	0.263		
Std. Dev.:	0.1		0.422	0.883	0.000		

CG	Temperature ℃	Model	Diffusivity mm^2/s	Uncertainty %	Conductivity W/(m*K)	Cp-table J/(g*K)	Li
	1	25.0	In-plane Isotropic(I)	49.947	0.3	157.334	0.350
	2	25.0	In-plane Isotropic(I)	50.031	0.3	157.599	0.350
	3	25.0	In-plane Isotropic(I)	50.302	0.2	158.451	0.350
	4	25.0	In-plane Isotropic(I)	50.172	0.3	158.042	0.350
	5	25.0	In-plane Isotropic(I)	50.062	0.3	157.696	0.350
Mean:	25.0		50.103		157.824	0.350	
Std. Dev.:	0.0		0.137		0.432	0.000	

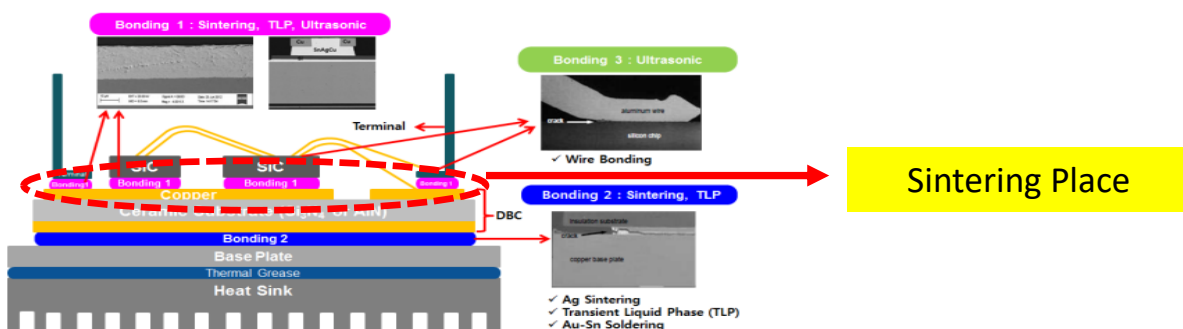
Working conditions

- Drying: 100°C 3min or 120°C 1min
- Temporary joint
 - NPR : After pre-drying, chip bonding and then main sintering.
 - PR : Temporary chip bonding after printing line drying is performed on a 5~10kg/100~150°C plate.
- Pressurized sintering conditions
 - Pressure: 20MPa ↓
 - Peak Temperature: 200~300°C
 - PR Hot Press Time: MAX. 3~5min
 - NPR Time: MAX. 60~120min
 - Atmosphere: Air or N₂

※ Copper paste is prepared in a vacuum/ nitrogen atmosphere

Storage method

- Epoxy Type (EP)
 - Temperature: Store at -10°C or below → Use mixing 1 hour after thawing at room temperature
 - Storage period: 6 months
 - Disposal principle after operation at room temperature
 - Resin Type(EC)
 - Temperature: 0~10°C / Thaw 1 hour before work
 - Storage period: 12 months
 - Disposal principle after operation at room temperature
- ※ If the above storage conditions are followed, the storage period is guaranteed.



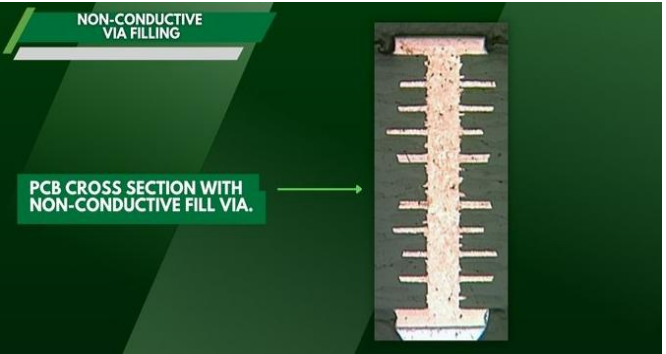
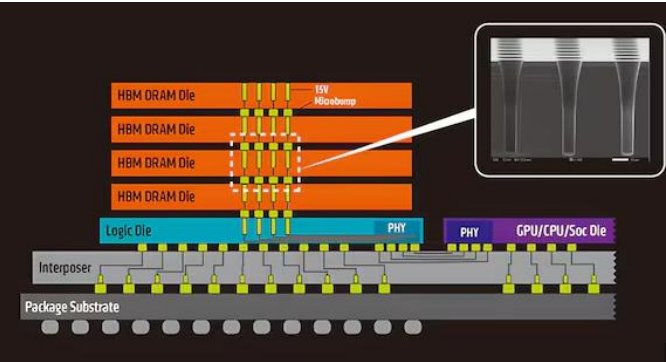
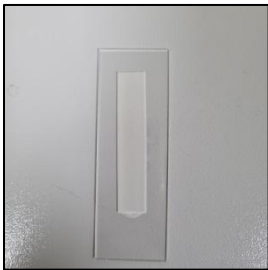
5. Via Filling Paste



Paste Information

ITEM	Particle Size
	100nm~5um
Filler Content	50~90%
Heating Oven	150~200°C 60min ↑
Air Condition	Air

- Printing Type
 - 1. Screen Printing
- Sintering Type : Heating
- High Tg : 170~180°C
- Low Permittivity
- Low CTE



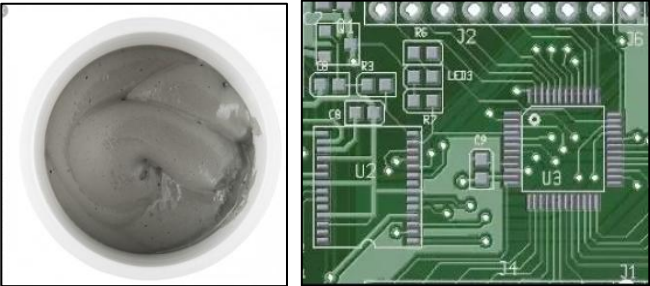
Calculation Results			
Nb	Thickness [mm]	Permittivity	Loss Tangent
1	0.09500	2.97887	1.55470e-02
2	0.09500	2.96794	1.55070e-02
3	0.09500	2.99637	1.57070e-02
4	0.09500	2.99483	1.56730e-02
5	0.09500	2.89231	1.53030e-02

Product name	Viscosity (Pa.s)	Specific resistance (150°C)	Key Features
DSAM-I Series	10~100	Insulation	Permittivity : 3.0 ↓
DSAM-CS090EC	20±5	3.2*10-5	CTE : <20 Thermal Conductivity : >30

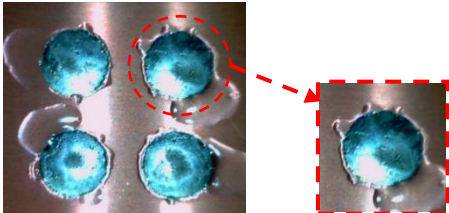
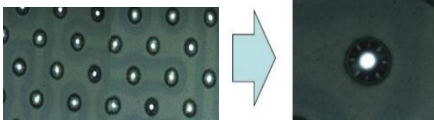
Application

Field	Purpose	Substrate	Advantage
Via Filling	-	Glass / PCB Via Hole	Low CTE / Low Cost
Heat dissipation	-	LED/Chiller system	Fast heat dissipation

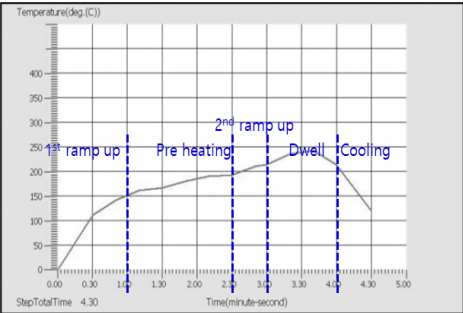
6. Solder Paste



Solder Ball & Wetting Test



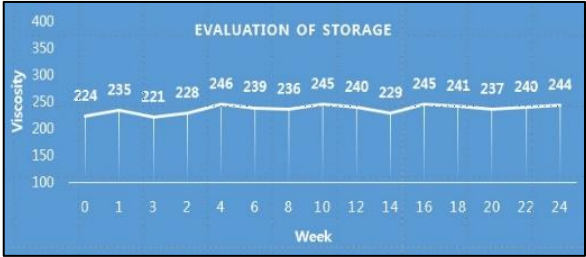
Solder Paste Reflow Profile



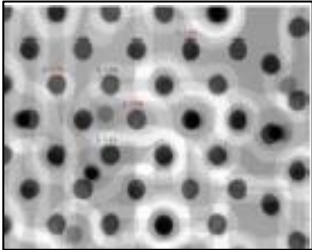
Pre heating			Dwell			Cooling	
Time	Peak(°C)	Max(°C)	Time	°C	Max(°C)	°C/sec	°C
144sec	150 ~ 190	200	72sec	215°C ↑	235 ~ 250	108sec	215~120

- Sintering Type : Heating (Reflow Oven)
- Viscosity change : 12 month / Rate of change 15% ↓
- Void : Max 3% ↓
- Halogen Free

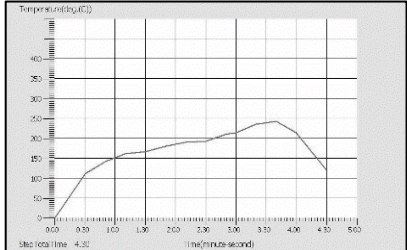
Viscosity Evaluation Result



Void Test (Max. 3%↓)



Reflow Profile

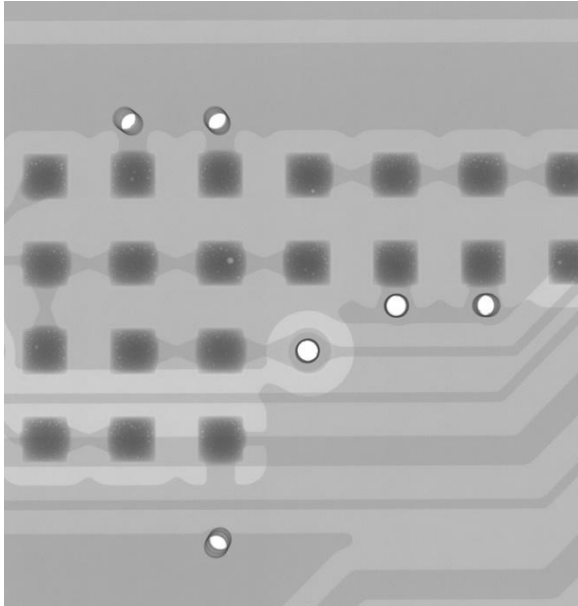


Product name	Viscosity (Pa.s)	Alloy	Printing Guarantee Time	Other
DSAM-U/P/I Type6~Type9	200±30	SnAg3.0Cu0.5/SnCu0.7/In8	12h	Solvent Soluble : S Water Soluble : W
	200±30	SnAg3.0Cu0.5, S/W	12h	
	200±30	Sn42Bi58, S/W	12h	

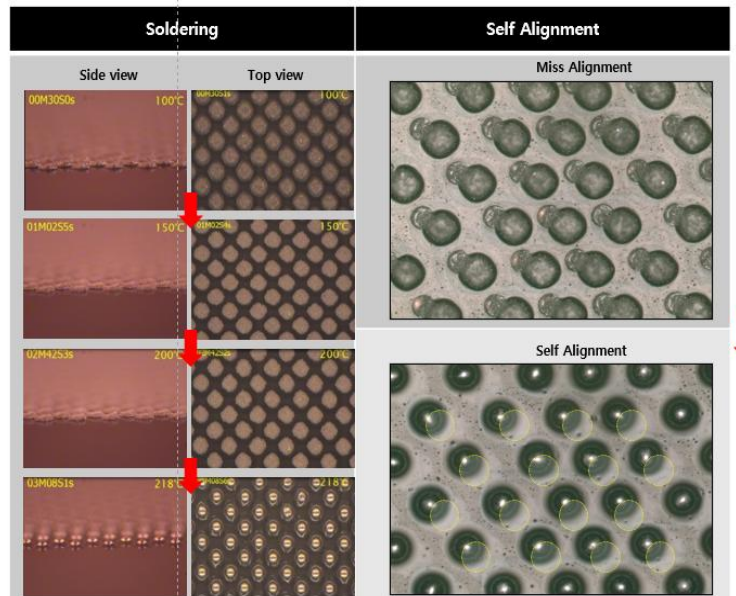
Application

Field	Purpose	Substrate	Advantage
PCB Bumping	High Printability	PCB / FPCB	Low Viscosity Change Low Void Low Cost Fast delivery
SMT	High Printability	PCB / FPCB	
Chip Bonding	High Tackiness	PCB / FPCB	

Void / Soldering

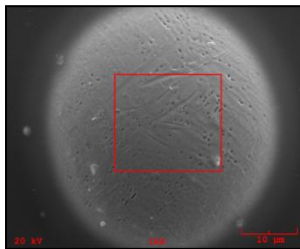
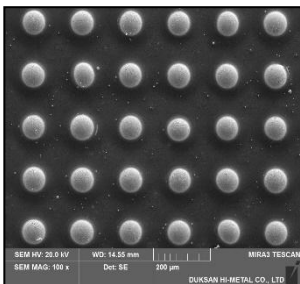


▶ Soldering 성 및 Self Alignment 평가 결과



1. Low Void (Max. 3% ↓)
2. Self alignment Test PASS

IMC Data (SEM)



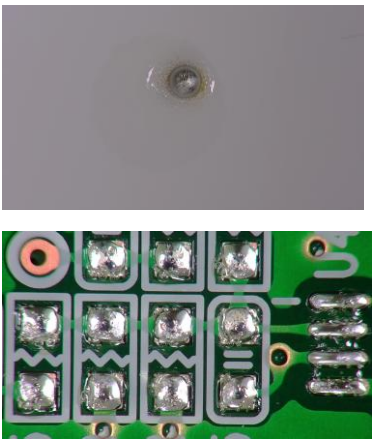
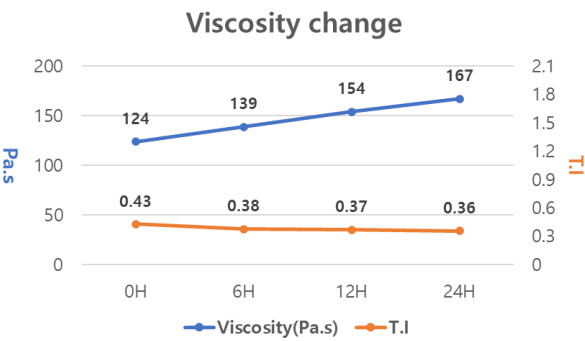
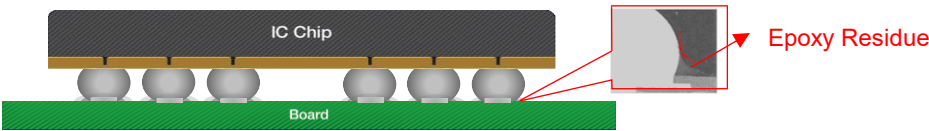
▶ IMC / Surface 평가 결과

	X-section	IMC	EDS																																																																																
Ref.	X1000 SEM: 10.0 kV x1000.0 BSED: 10.0 kV x1000.0 Date: 08/03/2018 20 μm MIRACAL TESCOCAN MIRACAL TESCOCAN MIRACAL TESCOCAN	X10000 SEM: 10.0 kV x10000.0 BSED: 10.0 kV x10000.0 Date: 08/03/2018 2 μm MIRACAL TESCOCAN MIRACAL TESCOCAN MIRACAL TESCOCAN	<table><thead><tr><th>El.</th><th>Line</th><th>Intensity</th><th>Con.</th><th>Unit</th><th>Error</th><th>Ratio</th><th>Ratio</th></tr></thead><tbody><tr><td>P</td><td>Kα</td><td>65.85</td><td>2.47%</td><td>wt%</td><td>0.114</td><td>0.172</td><td>+</td></tr><tr><td>Si</td><td>Kα</td><td>14.47</td><td>1.45%</td><td>wt%</td><td>0.124</td><td>0.196</td><td>+</td></tr><tr><td>Cu</td><td>Kα</td><td>201.26</td><td>25.54%</td><td>wt%</td><td>0.558</td><td>0.680</td><td>+</td></tr><tr><td>Pb</td><td>Lα</td><td>17.80</td><td>2.34%</td><td>wt%</td><td>0.201</td><td>0.266</td><td>+</td></tr><tr><td>Ag</td><td>Lα</td><td>20.48</td><td>2.75%</td><td>wt%</td><td>0.254</td><td>0.318</td><td>+</td></tr><tr><td>Sr</td><td>Lα</td><td>292.36</td><td>41.02%</td><td>wt%</td><td>0.760</td><td>0.975</td><td>+</td></tr><tr><td>As</td><td>Lα</td><td>11.15</td><td>1.12%</td><td>wt%</td><td>1.066</td><td>1.334</td><td>+</td></tr><tr><td>Ph</td><td>Lα</td><td>8.76</td><td>1.134%</td><td>wt%</td><td>1.430</td><td>1.802</td><td>+</td></tr><tr><td>+</td><td>+</td><td>+</td><td>100.00%</td><td>wt%</td><td>+</td><td>+</td><td>Total</td></tr></tbody></table>	El.	Line	Intensity	Con.	Unit	Error	Ratio	Ratio	P	Kα	65.85	2.47%	wt%	0.114	0.172	+	Si	Kα	14.47	1.45%	wt%	0.124	0.196	+	Cu	Kα	201.26	25.54%	wt%	0.558	0.680	+	Pb	Lα	17.80	2.34%	wt%	0.201	0.266	+	Ag	Lα	20.48	2.75%	wt%	0.254	0.318	+	Sr	Lα	292.36	41.02%	wt%	0.760	0.975	+	As	Lα	11.15	1.12%	wt%	1.066	1.334	+	Ph	Lα	8.76	1.134%	wt%	1.430	1.802	+	+	+	+	100.00%	wt%	+	+	Total
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+	+	+	100.00%	wt%	+	+	Total																																																																												
D S M T	X1000 SEM: 10.0 kV x1000.0 BSED: 10.0 kV x1000.0 Date: 08/03/2018 20 μm MIRACAL TESCOCAN MIRACAL TESCOCAN MIRACAL TESCOCAN	X10000 SEM: 10.0 kV x10000.0 BSED: 10.0 kV x10000.0 Date: 08/03/2018 2 μm MIRACAL TESCOCAN MIRACAL TESCOCAN MIRACAL TESCOCAN	<table><thead><tr><th>El.</th><th>Line</th><th>Intensity</th><th>Con.</th><th>Unit</th><th>Error</th><th>Ratio</th><th>Ratio</th></tr></thead><tbody><tr><td>P</td><td>Kα</td><td>76.76</td><td>2.40%</td><td>wt%</td><td>0.120</td><td>0.161</td><td>+</td></tr><tr><td>Si</td><td>Kα</td><td>13.97</td><td>1.45%</td><td>wt%</td><td>0.120</td><td>0.162</td><td>+</td></tr><tr><td>Cu</td><td>Kα</td><td>192.91</td><td>19.15%</td><td>wt%</td><td>0.478</td><td>0.590</td><td>+</td></tr><tr><td>Pb</td><td>Lα</td><td>16.59</td><td>2.16%</td><td>wt%</td><td>0.190</td><td>0.254</td><td>+</td></tr><tr><td>Ag</td><td>Lα</td><td>18.68</td><td>2.47%</td><td>wt%</td><td>0.227</td><td>0.308</td><td>+</td></tr><tr><td>Sr</td><td>Lα</td><td>284.62</td><td>46.30%</td><td>wt%</td><td>0.838</td><td>1.038</td><td>+</td></tr><tr><td>As</td><td>Lα</td><td>12.19</td><td>1.148%</td><td>wt%</td><td>1.066</td><td>1.360</td><td>+</td></tr><tr><td>Ph</td><td>Lα</td><td>9.40</td><td>1.180%</td><td>wt%</td><td>1.404</td><td>1.802</td><td>+</td></tr><tr><td>+</td><td>+</td><td>+</td><td>100.00%</td><td>wt%</td><td>+</td><td>+</td><td>Total</td></tr></tbody></table>	El.	Line	Intensity	Con.	Unit	Error	Ratio	Ratio	P	Kα	76.76	2.40%	wt%	0.120	0.161	+	Si	Kα	13.97	1.45%	wt%	0.120	0.162	+	Cu	Kα	192.91	19.15%	wt%	0.478	0.590	+	Pb	Lα	16.59	2.16%	wt%	0.190	0.254	+	Ag	Lα	18.68	2.47%	wt%	0.227	0.308	+	Sr	Lα	284.62	46.30%	wt%	0.838	1.038	+	As	Lα	12.19	1.148%	wt%	1.066	1.360	+	Ph	Lα	9.40	1.180%	wt%	1.404	1.802	+	+	+	+	100.00%	wt%	+	+	Total
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- IMC Data

1. Alloy IMC formation PASS
2. Reliability Test PASS

7. Epoxy Solder Paste



※ Dry Test (150°C 24hr)

	Before	After
Alumina		
Glass		

Epoxy Solder Paste

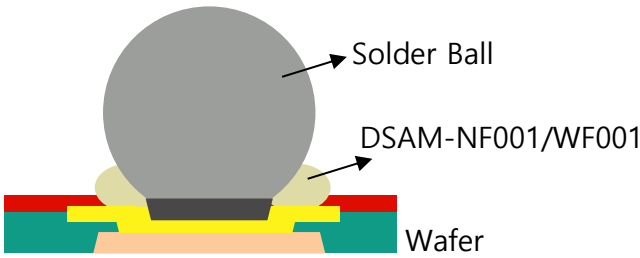
- 1. Screen Printing
- 2. Dotting Printing
- 3. Etc. (Customizing)
- Stencil life : 6h ↑
- DST : SAC305 20~30% ↑
- Void : Max 7% ↓
- Low yellow Index

Product name	Viscosity (Pa.s)	Alloy	Printing Guarantee Time	Other
DSAM-U/P E Type6~7	20~200	SnAg3.0Cu0.5 SnAg3.0Cu0.5/SnCu0.7/In8	8h	Screen : S Pin Dotting : P

Application

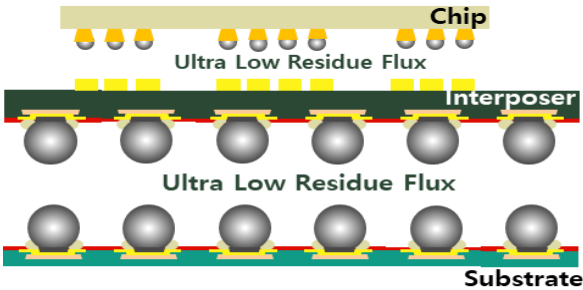
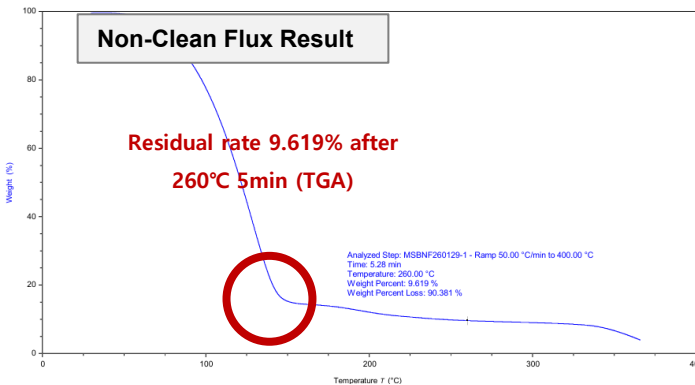
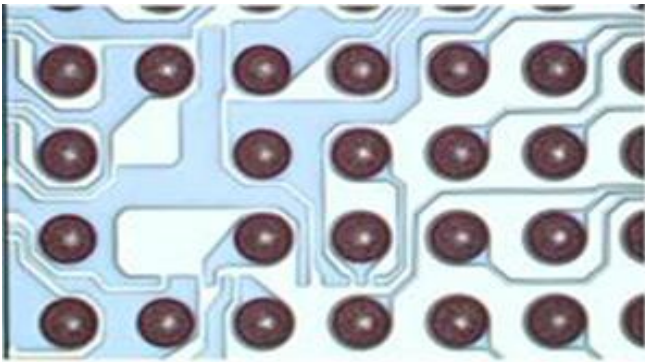
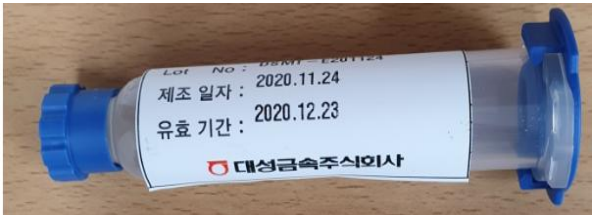
Field	Purpose	Substrate	Advantage
PCB Bumping	High Strength	PCB / FPCB	Low Viscosity Change Low Void Low Cost Fast delivery
LED Bonding	High Transparency	Lead frame	

8. Flux



< application of Ball Flux >

Product Image



< Application of POP package >

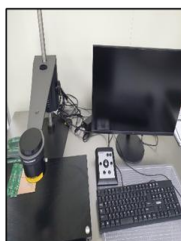
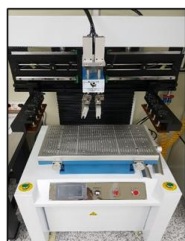
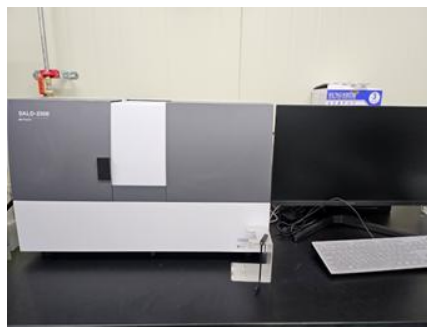
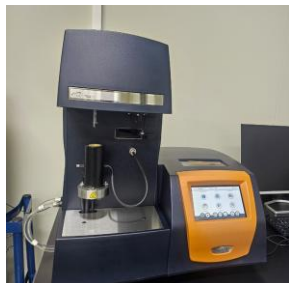
Product name	Viscosity (Pa.s)	Cleaning Type	Printing Guarantee Time	Other
DSAM-WF001M	50±10	Solvent Soluble	12hr	Halogen Free
DSAM-WF001	20±5	Water Soluble	12hr	Non-Halogen
DSAM-NF002	50±10	Non Clean	12hr	Non-Halogen TGA : 9%

Application

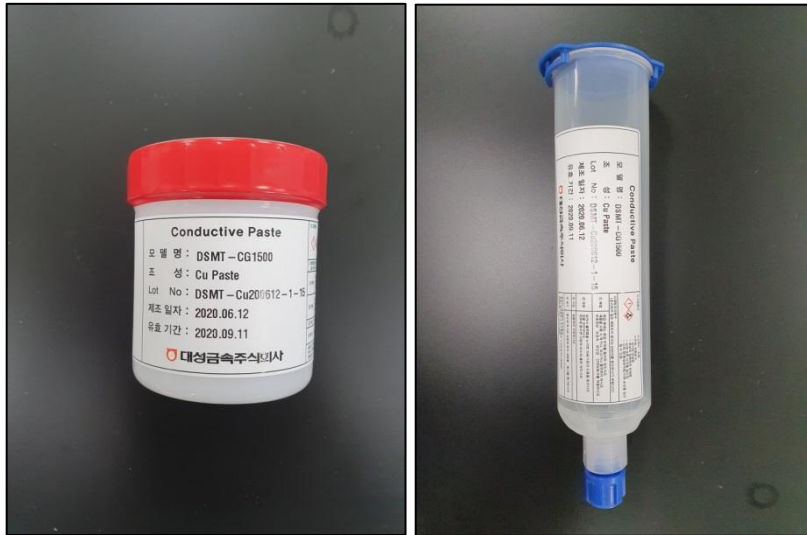
Field	Purpose	Substrate	Advantage
PCB Bumping	High Activation / Adhesiveness	PCB / FPCB/LED PKG	Low Viscosity Change Low Cost High Quality Fast delivery
Solder Ball Bonding	High Activation	PCB / FPCB	

9. Manufacturing line & Equipment

- Clean Room (10,000 Class ↓)
- Dispersion equipment
- Analysis equipment
- Reliability equipment



10. Packaging



- 6oz / 5cc/ 10cc / 30cc Syringe
- 500g Jar
- 150mℓ Jar (Ball Flux)
- 1kg Jar
- 2kg Jar

11. Storage

- Storage Standard : 150mL jar packing & refrigerator storage
- Storage Place
 1. Nomal Solder Paste/Flux : Refrigerator (Below 10°C)
 2. Cu-Graphene/Ag/ACH Paste/Epoxy Solder
 - Epoxy Type (EP)

Temperature: -10°C or lower / Thaw 1 hour before work

Storage period: 6 months

Disposal principle after operation at room temperature

 - Resin Type(EC)

Temperature: 0~10°C / Thaw 1 hour before work

Storage period: 12 months

12. Manufacture Company

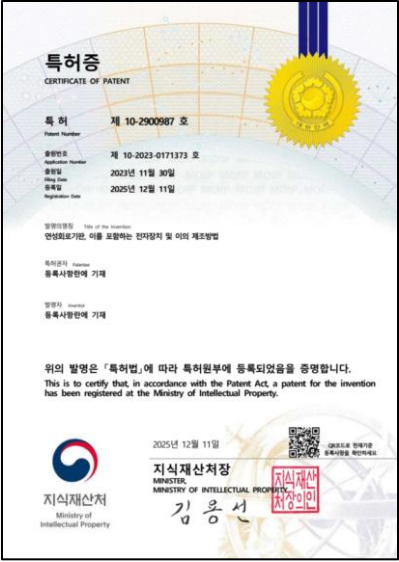
- Company Name : DAESUNG METAL
- Address : 89, Bukhang-ro 120 beon-gil, Seohae-gu, Incheon, Republic of Korea
- T +82 32)575-8547 / M +82 10-6625-8013 / E-mail leesangmin0529@dsmetal.com



13. Patent & Certification



13. Patent & Certification



14. R&D Technical Roadmap

Mid- to long-term Technical Load Map

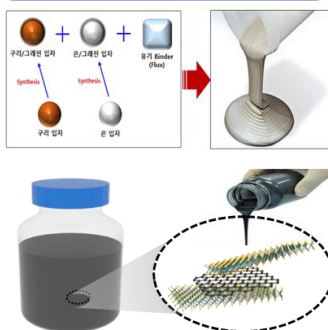


PKG Material	Non Clean Flux (Less than 1% residue) Micro Solder Ball WS Flux Type7 Epoxy Solder Paste Type9~10 Solder Paste Non Clean Solder Paste
Conductive Material	Car heating paste Power semiconductor copper-silver hybrid paste Copper-graphene bonding paste Power semiconductor silver paste Micro LED bonding paste
Basic Material	Powder for batteries Ag Powder D50 50~100nm Ag Powder D50 5~10um Flake Powder for contact Ag Powder D50 30~50um Ag-Graphene Nano Powder

Electronic material development

Cu-Graphene Powder & Paste/Ink	Epoxy Solder Paste
Ag-Cu-Gr Paste & Ag Paste/Powder	Water Soluble Flux & Paste
Solder Paste	Ball Flux & Micro Ball Flux & Non-Clean Flux
Solder Flux/Non Clean Flux	Epoxy Adhesive

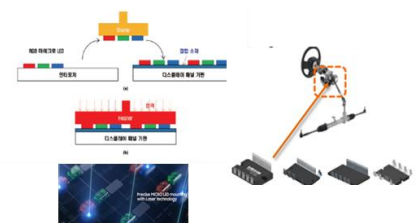
Nanoparticles and Metal-Graphene Particles
Next-Generation Pastes and Fluxes



Electrical/Semiconductor Bonding Materials
Substrate Electrodes and Heat Dissipation Materials



Research on next-generation micro LED and power semiconductor bonding paste materials



Infinite passion n innovation!

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Incheon, Republic of Korea



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