DSAM Material Introduction

Content.

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

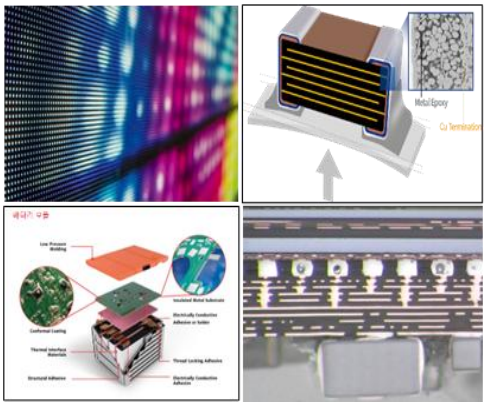
Headquarters expansion
(Incheon, South Korea)

2020~

R&D Center

Electronic material development

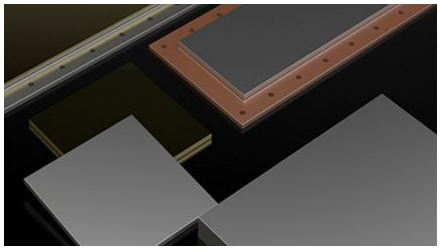
-. Cu-Graphene Powder & Paste/Ink
-. Ag-Cu-Gr Paste & Ag Paste/Powder
-. Solder Paste & Flux
-. Epoxy Solder Paste
-. Water Soluble Flux & Paste
-. Ball Flux & Micro Ball Flux & Non-Clean Flux
-. Epoxy Adhesive



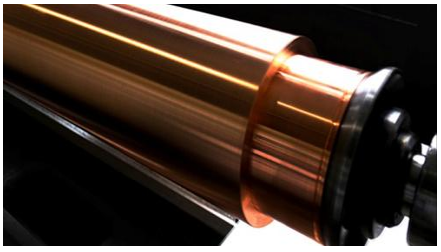
2. Product line-up

※ Sputtering Target

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

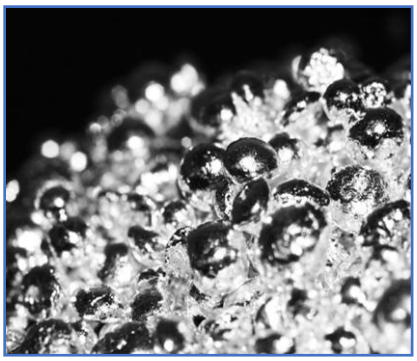
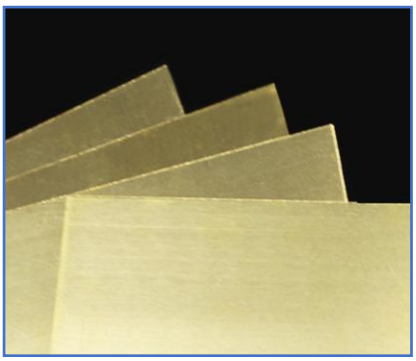
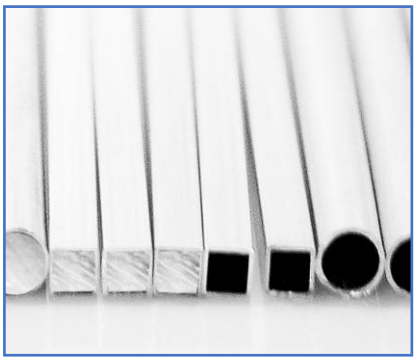
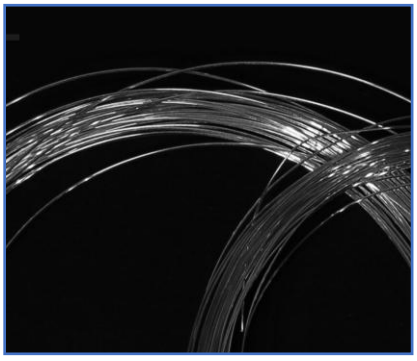


Cu Cylinder target



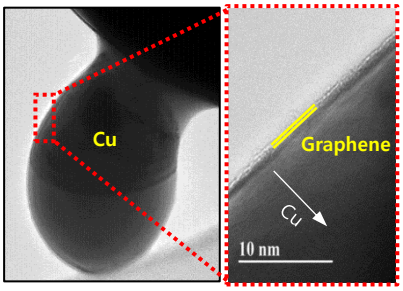
※ Silver / Gold Bar, Coin

※ Ag & Au Product

※ Plating material


3. Cu-Graphene Paste/Powder

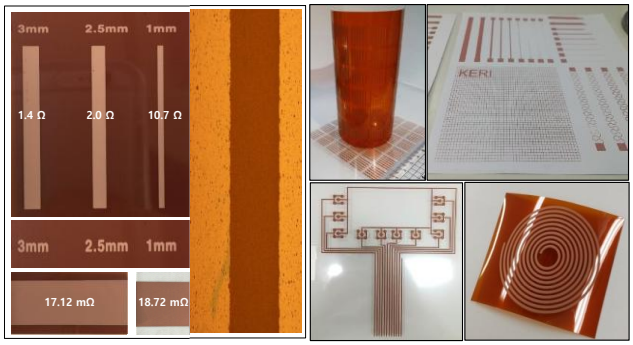


Cu-Graphene Paste

-. Particle Size

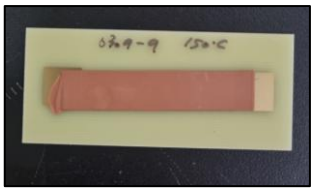
ITEM	Size	
	1.5㎛	400㎚
Vacumm N2 Oven	200℃ 1hr	200℃ 1hr
N2 Reflow	180℃ 5min 250℃ 20min	180℃ 5min 230℃ 20min

Specific resistance

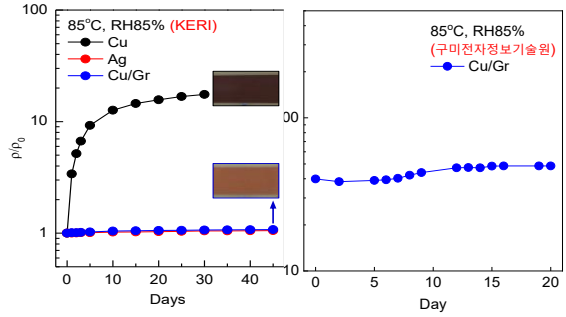


Air Oven Type (Metal & Silk Mask)

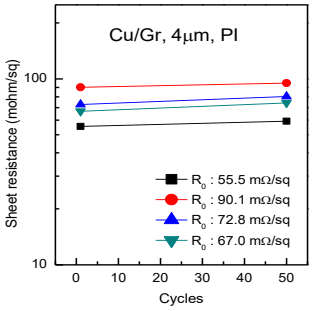
Cu-Graphene Paste

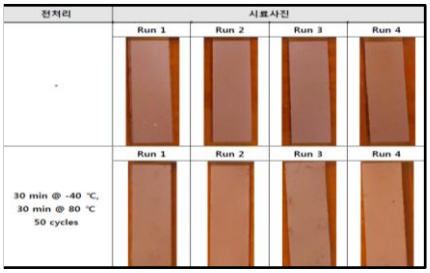


Temperature/Humidity test (85°C, 85%)



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



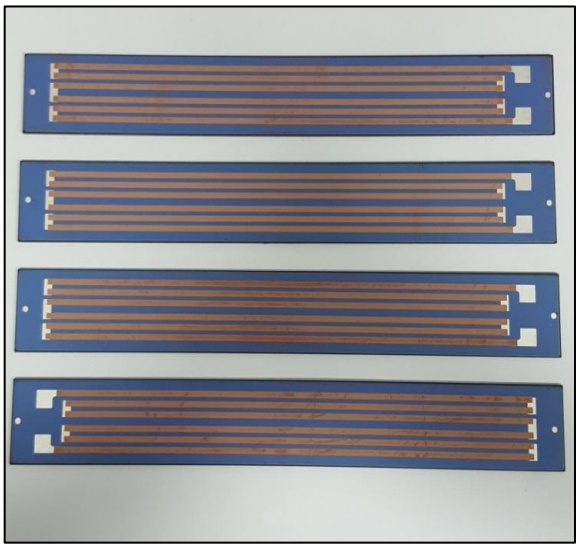


Product name	Particle Size	Specific resistance	Viscosity (cps)
DSAM-CG Series	1.5㎛	3 mΩ.cm ↓	10,000~100,000
	400㎚	3 mΩ.cm ↓	10,000~100,000
	1.5㎛,400㎚ Hybrid	3 mΩ.cm ↓	10,000~100,000

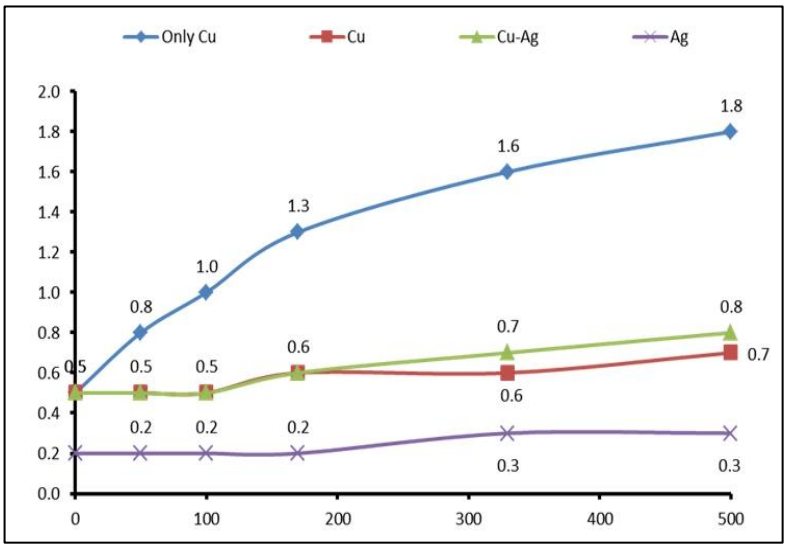
Application

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



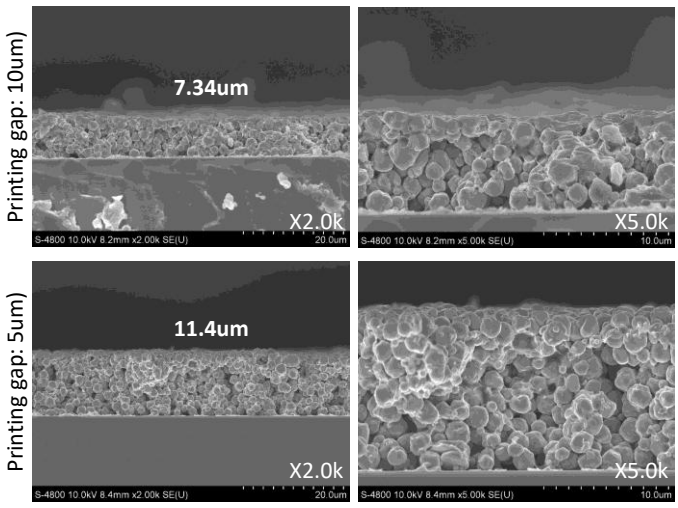
Reliability evaluation result

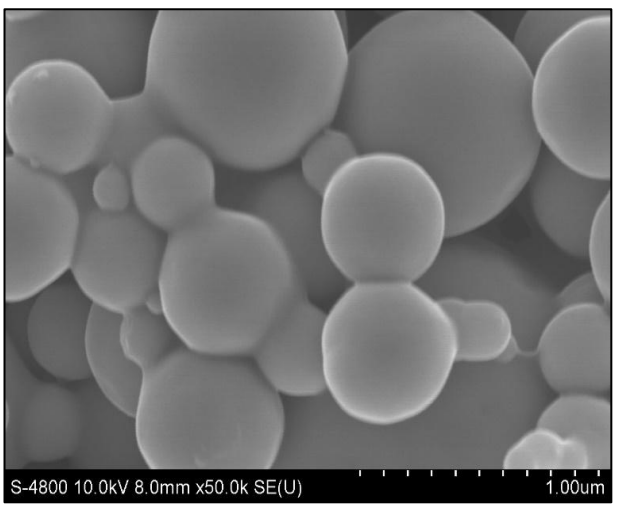


1. PTC heater (EV)
2. Pattern printing
3. Solar electrode circuit
4. Heat dissipation material
5. Via filling

※ Cu-Graphene has the same reliability as Ag.

SEM Image



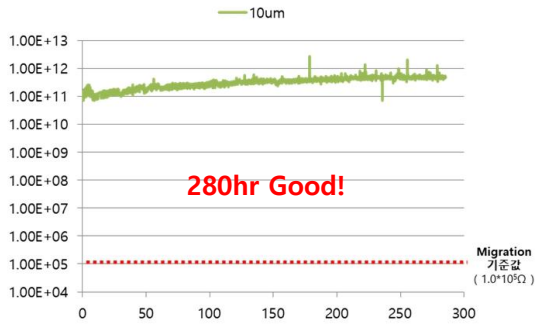


-. Binder Type

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

4. Ag Paste / Ag-Graphene Powder & ACH(Ag-Cu-Gr) Paste

Ag-Graphene Paste Migration Test Result



Ag Paste & Ag-Cu-Graphene Paste

-. Particle Size

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

-. Printing Type

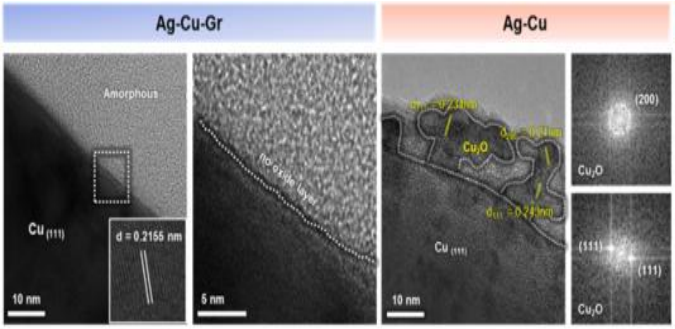
→ Etc. (Customizing)

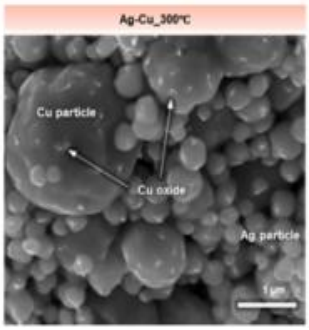
-. Sintering Type : Heating, Light sintering

-. Low Temp. Type : 100~200℃

-. TGA : Sintering Ag or ACH Paste Hume : 10% ↓

-. bonding Type Adhesive Epoxy Type : 10.8 W/mk



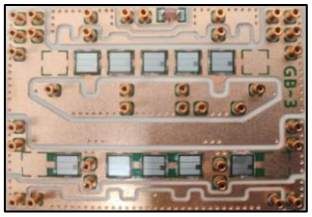


Product name	Particle Size	Specific resistance (200℃)	Viscosity (cps)
DSAM-AG Series	Ag Micro+Nano	1 mΩ.cm ↓	10,000~100,000
	Ag Micro	1 mΩ.cm ↓	10,000~100,000
DSAM-ACH Series	Cu-Graphene 10~30%/ Ag	5~10 mΩ.cm ↓	10,000~100,000
	Cu-Graphene 40~60%/ Ag	3~5 mΩ.cm ↓	10,000~100,000

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

→ DSAM-AG/ACH(Ag-Cu-Graphene) Series



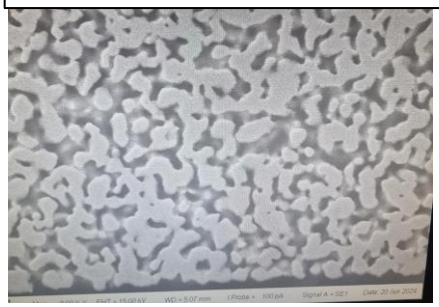
Introduction

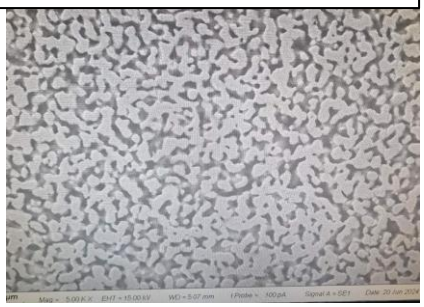
DSAM-AG/ACH products are composite bonding materials of Ag or Cu-Graphene and are pastes used for chip bonding and die attach.

It has high sintering performance and excellent bonding properties and can be used in both non-pressure and pressure processes.

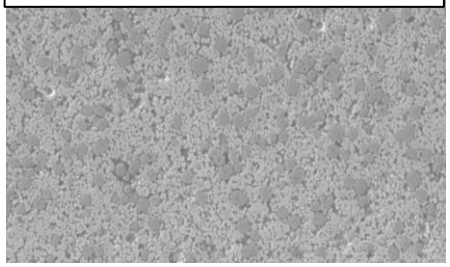
Item	Unit	DSAM-AG	DSAM-ACH (Ag-Cu-Graphene)	DSAM-CG (Cu-Graphene)
Viscosity(Pa.s)	Pa.s	10~50	10~50	10~50
Thixotropic Index(T.I)		0.4 ~ 1.0	0.4 ~ 1.0	0.4 ~ 1.0
Viscosity Recovery rate	%	Below 10	Below 10	Below 10
Powder Content	%	Silver 90	Silver 70~50 Cu-Graphene 20~40	Cu-Graphene 90
Thermal conductivity (250℃ 120min Non-Pressure)	W/mk	200~250	120~150	N2/Vac.
TGA (250℃ 30min)	%	90~93%	90~93%	90~93%
Color		Silver	Silver or Dark Silver	Brown
Sheet resistance (200℃ 30min Non-Pressure)	mΩ/sq	1 ↓	10 ↓	N2/Vac. 50 ↓
Water contents in Paste	%	Less than 3.0	Less than 3.0	Less than 3.0

Non- Press Type AG Sintering Paste





Non- Press Type ACH Sintering Paste



AG

	perature °C	Model	Diffusivity mm^2/s	Conductivity W/(m*K)	Cp J/g/K	Pulse type
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**	

ACH

	perature °C	Model	Diffusivity mm^2/s	Uncertainty %	Conductivity W/(m*K)	Cp-table J/(g*K)	L
1	25.0	In-plane Isotropic(l)	42.097	0.1	125.029	0.330	
2	25.0	In-plane Isotropic(l)	42.230	0.1	125.424	0.330	
3	25.0	In-plane Isotropic(l)	42.104	0.1	125.050	0.330	
Mean:	**25.0**		**42.144**		**125.168**	**0.330**	
Std. Dev.:	**0.0**		**0.075**		**0.222**	**0.000**	

Working conditions

- Drying: 100℃ 3min or 120℃ 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℃ plate.

- Pressurized sintering conditions

Pressure: 20MPa ↓

Peak Temperature: 250~300℃

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: -10℃ or lower / Thaw 1 hour before work

Storage period: 6 months

Disposal principle after operation at room temperature

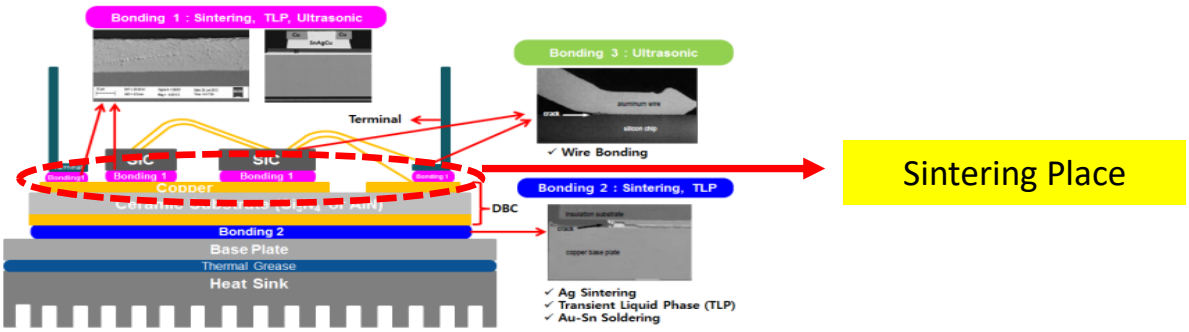
- Resin Type(EC)

Temperature: 0~10℃ / 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.

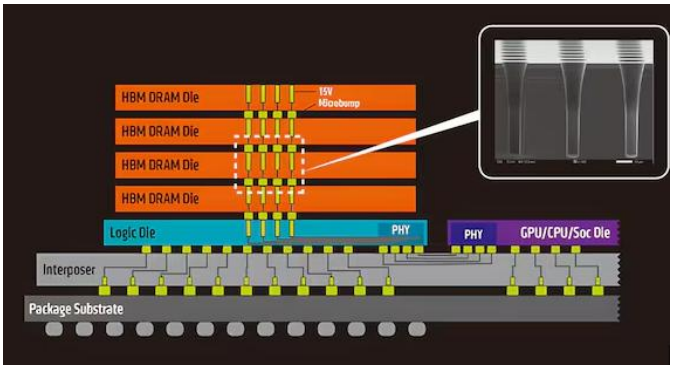


5. Insulation Paste

Insulation Paste

-. Particle Size

ITEM	Size
	100nm~5um
Filler Content	50~60%
Heating Oven	150~300℃ 30min
Air Condition	Air



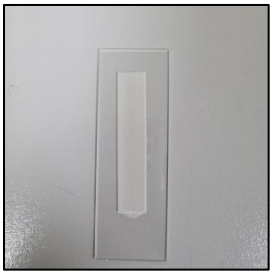
-. Printing Type

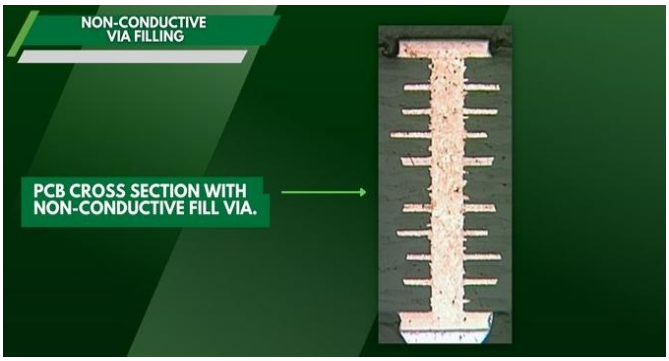
1. Screen Printing

-. Sintering Type : Heating

-. High Tg : 170~180℃

- Low Permittivity 3.0~3.2





Calculation Results

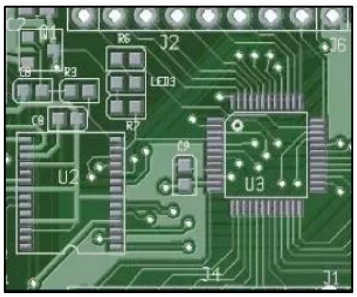
Nb	Thickness [mm]	Permittivity	Loss Tangent
1	0.09500	2.97887	1.55470e-02
2	0.09500	2.96794	1.55070e-02
3	0.09500	2.99637	1.57070e-02
4	0.09500	2.99483	1.56730e-02
5	0.09500	2.89231	1.53030e-02

Product name	Particle Size	Specific resistance (150℃)	Viscosity (cps)
DSAM-I Series	Micro or Nano	Insulation	10,000~100,000

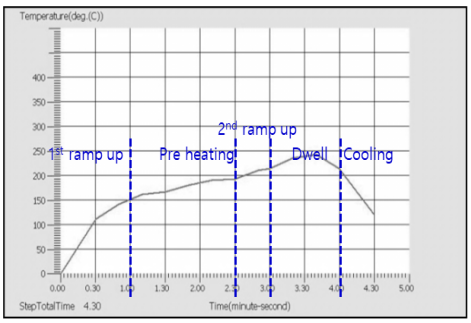
Application

Field	Purpose	Substrate	Advantage
Via Filling	-	PCB/FPCB Via Hole	High Tg / Low Cost
Heat dissipation	-	LED/Chiller system	Fast heat dissipation

6. Solder Paste

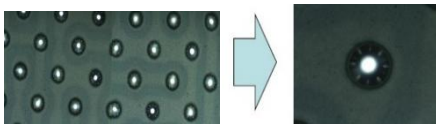


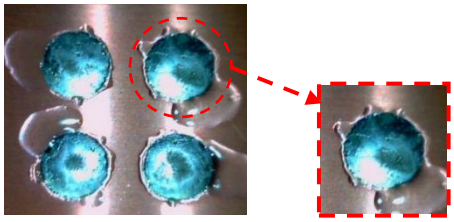
Solder Paste Reflow Profile



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

Solder Ball & Wetting Test



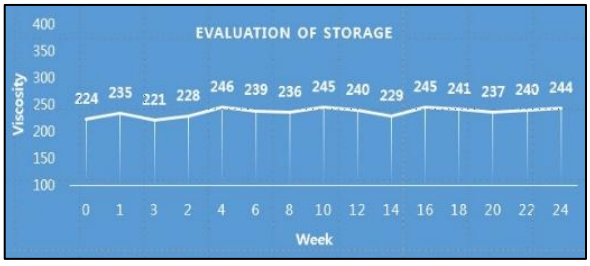


-. Sintering Type : Heating (Reflow Oven)

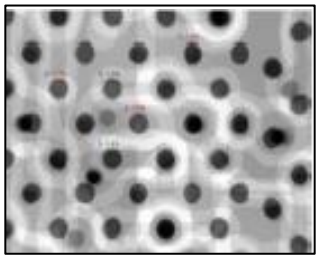
-. Viscosity change : 6 month / Rate of change 15% ↓

-. Void : Max 7% ↓

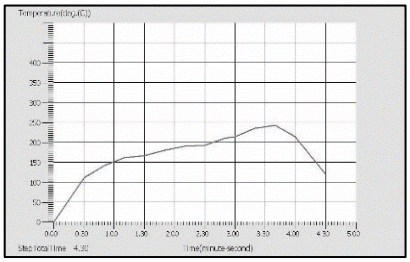
Viscosity Evaluation Result



Void Test (Max. 3%↓)



Reflow Profile

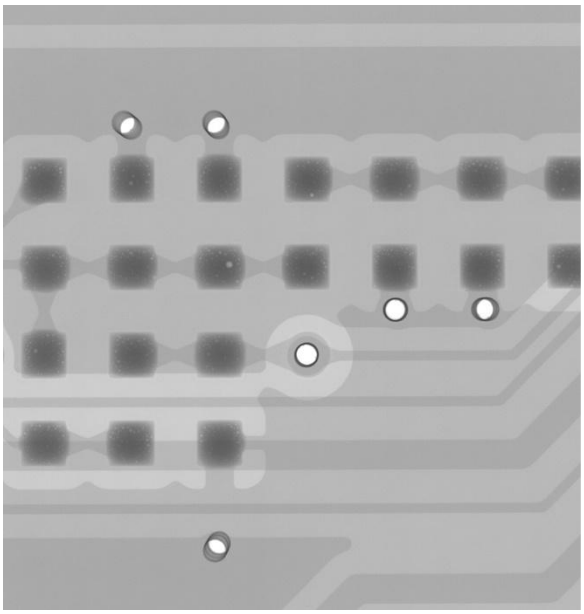


Product name	Viscosity (Pa.s)	Alloy	Printing Guarantee Time	Other
DSAM-U/P/I Type6~Type9	200±50	SnAg3.0Cu0.5/SnCu0.7/In8	12h	Solvent Soluble : S Water Soluble : W
	200±50	SnAg3.0Cu0.5, S	12h	
	200±50	SnAg3.0Cu0.5, W	12h	
	200±50	SnIn8Ag3.5Bi0.5	12h	

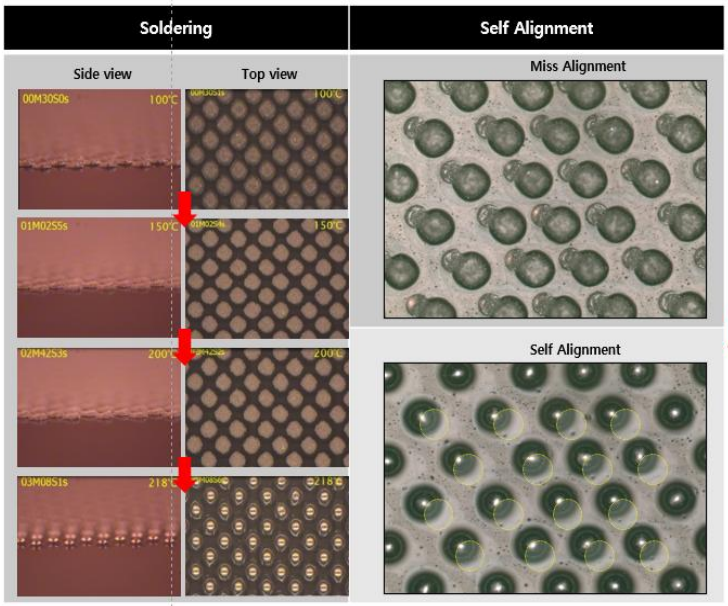
Application

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

Void / Soldering

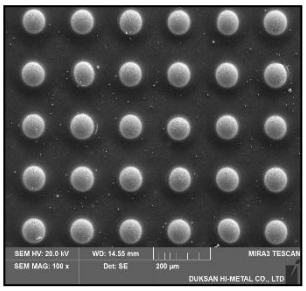


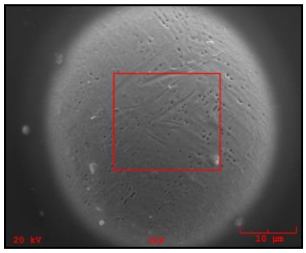
▶ Soldering 성 및 Self Alignment 평가 결과



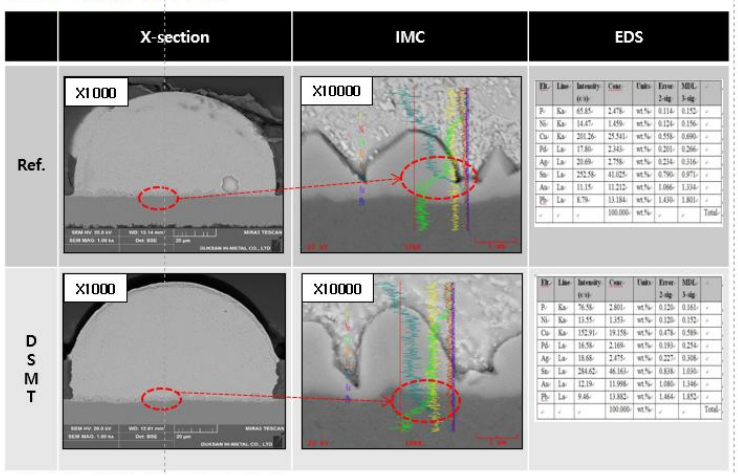
1. Low Void (Max. 7% ↓)
2. Self alignment Test PASS

IMC Data (SEM)





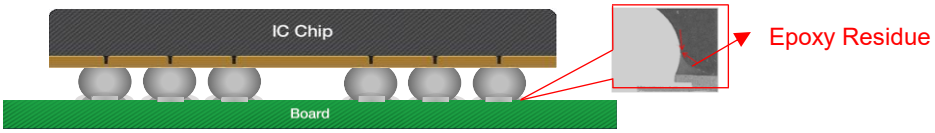
▶ IMC / Surface 평가 결과

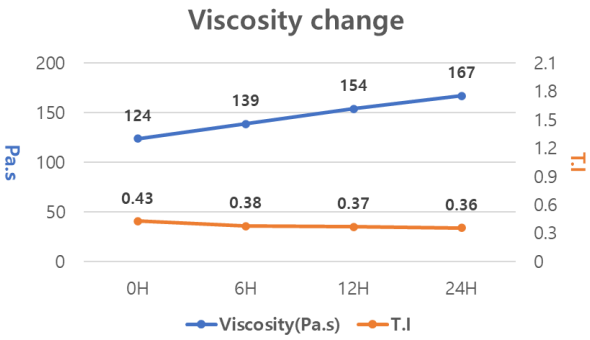


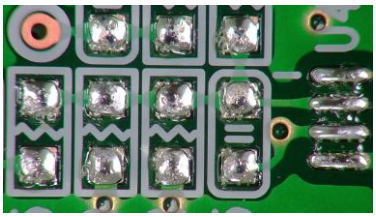
-. IMC Data

1. Alloy IMC formation PASS
2. Reliability Test PASS

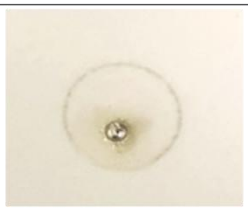
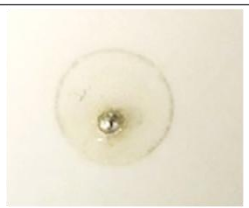
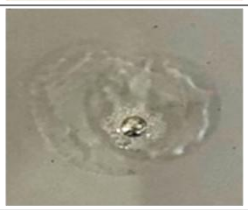
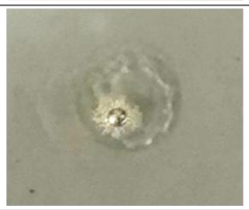
7. Epoxy Solder Paste







※ Dry Test (150℃ 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% ↓

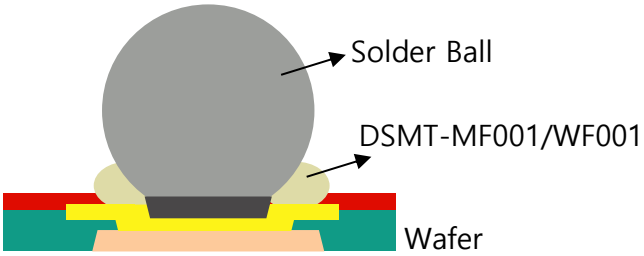
-. Low yellow Index

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

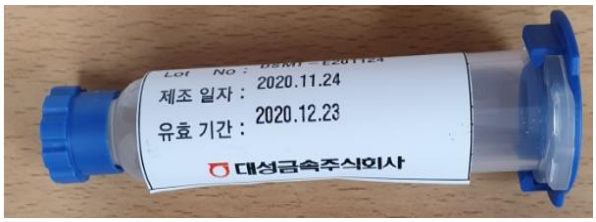
Field	Purpose	Substrate	Advantage
PCB Bumping	High Strength	PCB / FPCB	Low Viscosity Change Low Void Low Cost Fast delivery
LED Bonding	High Transparency	Lead frame	

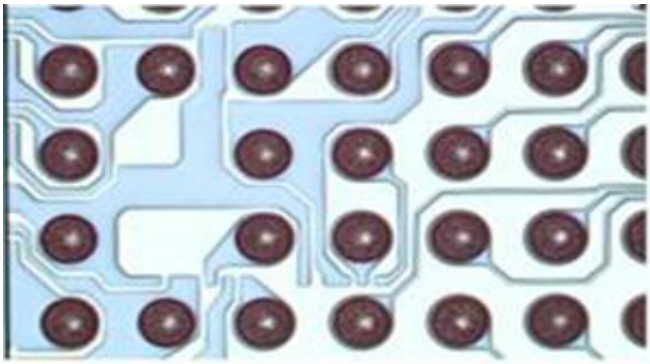
8. Solder Ball / Micro Solder Ball Flux / Non Clean Flux

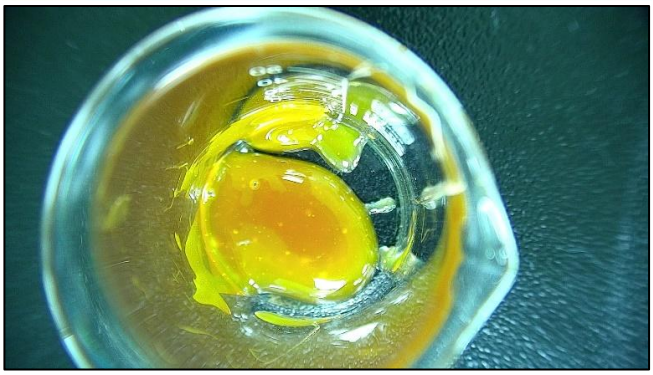


< application of Ball Flux >

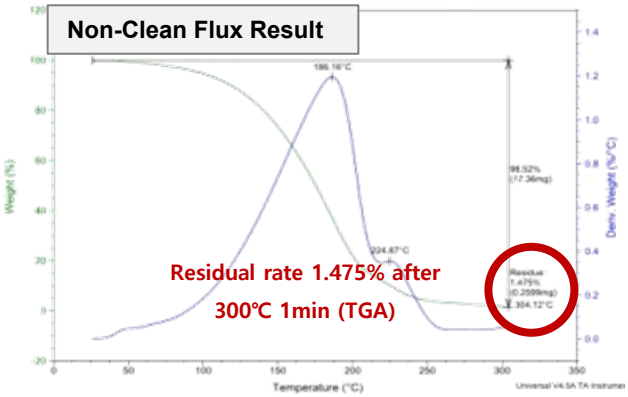
Product Image

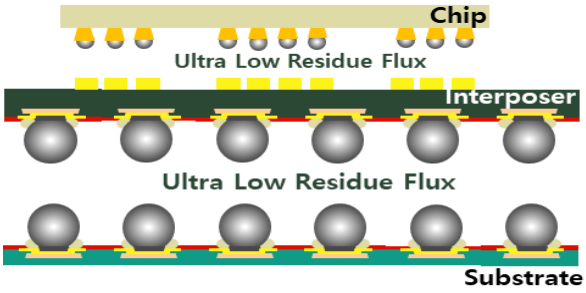






Non-Clean Flux Result





< Application of POP package >

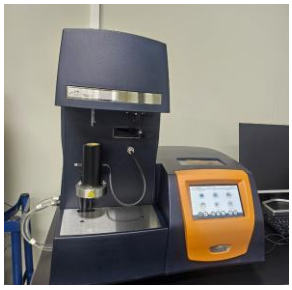
Product name	Viscosity (Pa.s)	Cleaning Type	Printing Guarantee Time	Other
DSAM-WF/MF/NF	10~150	Solvent Soluble	12h	Screen Type or Pin Dotting Type
	10~100	Water Soluble	12h	
	10~50	Non Clean	12h	

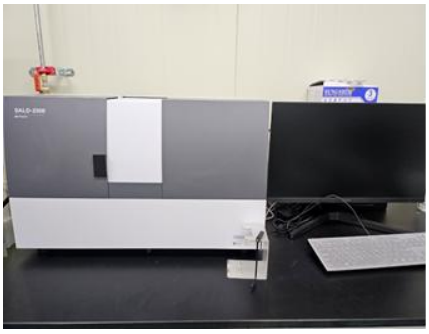
Application

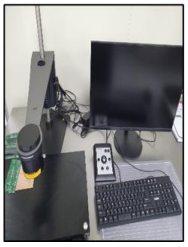
Field	Purpose	Substrate	Advantage
PCB Bumping	High Activation / Adhesiveness	PCB / FPCB	Low Viscosity Change Low Cost High Quality Fast delivery
Solder Ball Bonding	High Activation	PCB / FPCB	

9. Manufacturing line & Equipment

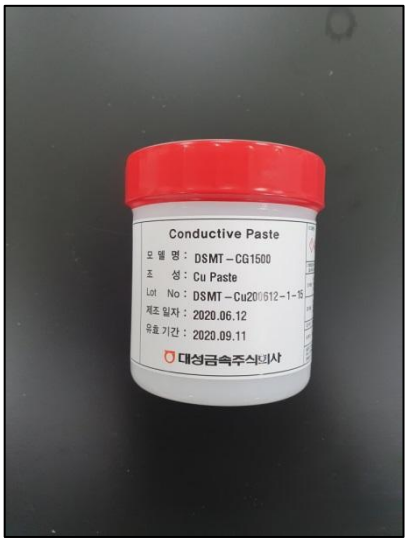
-. Clean Room (10,000 Class ↓)
-. Dispersion equipment
-. Analysis equipment
-. Reliability equipment

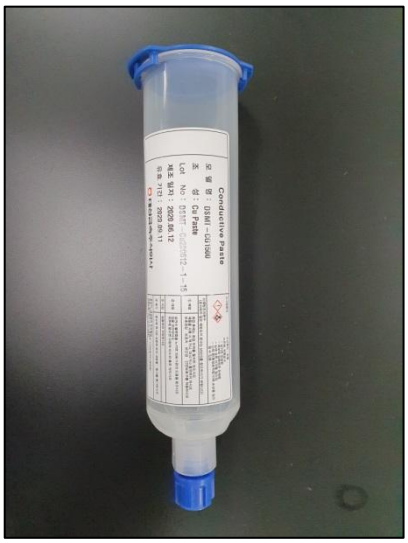






10. Packaging





- 6oz / 5cc/ 10cc / 30cc Syringe
- 500g Jar
- 150㎖ 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℃)

3. Cu-Graphene/Ag/ACH Paste/Epoxy Solder

→ Epoxy Type (EP)

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

Storage period: 6 months

Disposal principle after operation at room temperature

→ Resin Type(EC)

Temperature: 0~10℃ / Thaw 1 hour before work

Storage period: 12 months

12. Manufacture Company

- Company Name : DAESUNG METAL
- Address : 89, Bukhang-ro 120 beon-gil, Seo-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

특허증
CERTIFICATE OF PATENT

특허 Patent Number 제 10-2868966 호

출원번호 Application Number 제 10-2024-0168858 호
출원일 Filing Date 2024년 11월 22일
등록일 Registration Date 2025년 09월 30일

발명의 명칭 Title of the Invention
구리-그래핀 및 은 나노입자를 포함하여 본딩된 전력 반도체 패키지 및 그 제조 방법

특허권자 Patentee
대성금속주식회사(120111-*******)
인천광역시 서구 북항로120번길 89(원창동)

발명자 Inventor
등록사항란에 기재

위의 발명은 「특허법」에 따라 특허원부에 등록되었음을 증명합니다.
This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Ministry of Intellectual Property.

2025년 09월 30일

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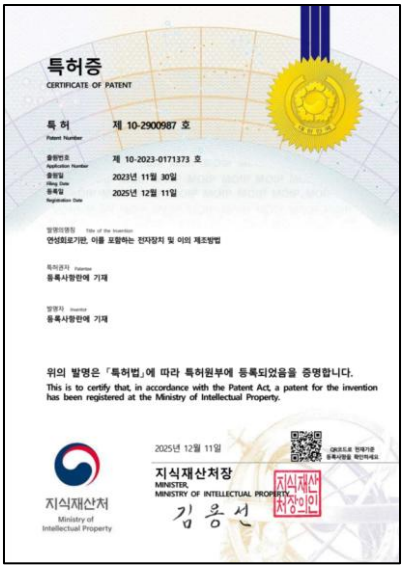
Ministry of Intellectual Property

지식재산처장
MINISTER,
MINISTRY OF INTELLECTUAL PROPERTY

지식재산처장의인



특허증
CERTIFICATE OF PATENT

특허 Patent Number 제 10-2900987 호

출원번호 Application Number 제 10-2023-0171373 호
출원일 Filing Date 2023년 11월 30일
등록일 Registration Date 2025년 12월 11일

발명의명칭 Title of the Invention
연성회로기판, 이를 포함하는 전자장치 및 이의 제조방법

특허권자 Patentee
등록사항란에 기재

발명자 Inventor
등록사항란에 기재

위의 발명은 「특허법」에 따라 특허원부에 등록되었음을 증명합니다.
This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Ministry of Intellectual Property.

2025년 12월 11일

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MINISTER,
MINISTRY OF INTELLECTUAL PROPERTY
김용선

지식재산처장의인

14. R&D Technical Roadmap

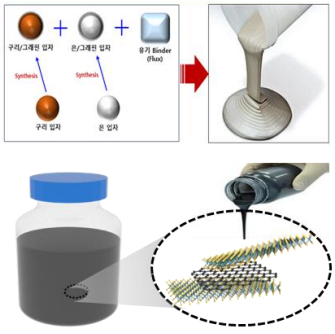
Mid- to long-term Technical Load Map

"25" → "26" → "28" → "30"

PKG Material	Non Clean Flux (Less than 1% residue) Non Clean Solder Paste Micro Solder Ball WS Flux Type7 Epoxy Solder Paste Type9~10 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 ParticlesNext-Generation Pastes and Fluxe



Electrical/Semiconductor Bonding MaterialsSubstrate 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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89, Bukhang-ro 120 beon-gil, Seo-gu,
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www.dsmetal.com