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Image & Printing

Reference No: Ioi-**IPS/xxx/270120**

IK-350
Nano Copper Ink for PET Substrates Application Notes

Overview

Copper ink IK-350 Nano Copper Ink is a solvent-based copper paste for additive printing of electronic patterns on PET substrates. Copper ink IK-350 Nano Copper Ink enables oxidation free, high conductivity copper printing in an air environment, with rapid self-sintering and curing at 200°C. Copper ink IK-350 Nano Copper Ink is the highest performance, most sustainable, lowest cost Copper ink suited for manual, semi- automatic or reel-to-reel screen printing applications.

The application notes provide instructions and guidelines for optimal screen printing with Copper ink IK-350 including:

- **Formulation Storage**
- **Screen Printing**
- **Drying**
- **Sintering**
- **Clean Up, Maintenance**

Printing guidelines and recommendations Copper ink IF-350 Storage

Copper ink IK-350 should be stored below -10°C. Mix the paste in the original container before printing using a paste mixer (Figure 1) - Eg. ZB500S, solder paste mixer, 15min at 300rpm, or manually until homogeneous in composition throughout.

Screen Printing

Copper ink IK-350 is suited for screen printing on PET substrates.

Pour the requisite volume of paste needed for printing to a new container and verify that it reaches room temperature before printing.
Select your desired screen mesh. The mesh defines the printed pattern layer thickness and pattern resolution. We recommend printing using a screen mesh of 100-150, NBC-MESH (Japan) UX100/040- UX 150/40. Screen printing is based on print-flood procedure.
Watch video

Recommended substrate:

Polyester (PET)	**Elecrom STS H.08 (opaque)** **Elecrom STS A.00 (transparent)**	**Polycrome** **https://www.elecrom.it/**
	HSPL 80 HT (opaque)	**Coveme** **https://www.coveme.com/**
	CF-T1/PD (transparent)	**Folex https://www.folex.com/**

Usage of other substrates is not recommended. Do not return any unused paste to the original container. Close and seal the original container and return to storage at -10°C.

Drying

After printing, dry the pattern immediately. Recommended drying equipment manufacturers and models:

Equipment	Manufacturer	Model	Drying condition
Thermal plate (Figure 2A)	**Fried Electric www.heatsenze.com**	**HP and GHP series**	**2min @ 90°C**
Reflow oven (Figure 2B)	**Puhui www.puhuit.com**	**T-961**	**90°C, SPD:40 (~180 sec), heating lamp No 3, 4, 5, 6- ON, No 1, 2- OFF (Figure 3)**
Oven (Figure 2C)	**MRC laboratory equipment**	**DFO-36**	**2min @ 80°C**

#Listed temperatures for thermal plate and oven are verified with a thermocouple.
Note: Other manufacturers and drying equipment models may be suitable once meet mentioned specifications.

Figure 1
solder paste machine

Figure 2A Thermal Plate

Figure 2B
Reflow Oven

Figure 2C
ZB500S, solder

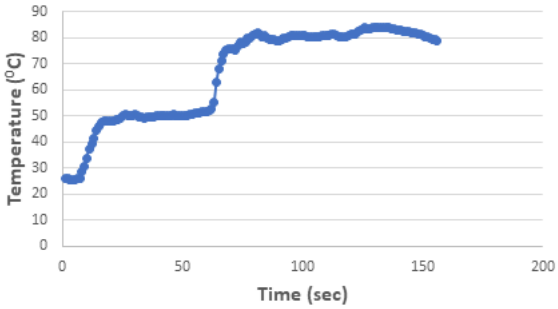

Figure 3. Temperature profile of the single cycle run (reflow oven)

Sintering

After drying, the printed pattern should be sintered within 72 hrs. Watch Drying Video.

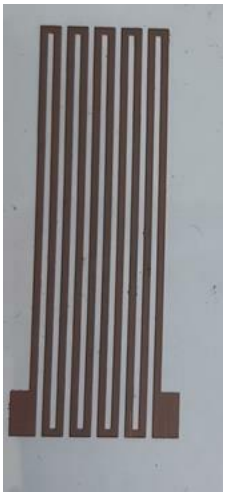

Figure 5 Non sintered (left) and sintered (right) printed pattern

The sintering process is based on thermal heating in air environment. No inert atmosphere (like nitrogen) required.

The sintering takes place under 'snap heating' (Achieving the desired temperature quickly in a few seconds). The Heat Press Machine (5000 psi SMASH Pneumatic Rosin Press) (Figure 4) should be used. Optimal sintering conditions are: 60 sec@ 200°C# (measured temperature), 0.6MPa.
We recommend placing the printed pattern in the heat press when it is sandwiched between two sheets of baking paper to prevent scratching and keeping the press clean.

https://www.aliexpress.com/item/32863189183.html?spm=a2g0s.9042311.0.0.222b4c4d1hZo5C (Size up to 14x18 cm)

https://www.aliexpress.com/item/32839752106.html?spm=a2g0s.9042311.0.0.222b4c4d1hZo5C

https://www.amazon.com/PowerPress-Hpm-1515-BK-Industrial-Quality-Digital-Sublimation/dp/B0773Y1TNX/ref=as_at?creativeASIN=B0773Y1TNX&linkCode=w61&imprT oken=3g4Mg5aeH1c3azp3iY7-Sg&slotNum=0&tag=tshirt-pro-20&th=1 (Manual Heat press, 15X15 Black)

Other commercially available equipment is not recommended for Copper ink IK-350 sintering and will result in poorly sintered printed patterns.
Caution: Always wear oven gloves when handling the heat press
Sintering efficacy can be verified by both resistance measurement and color change of the printed antenna. Dried, printed patterns prior to sintering appear brown; Sintered patterns are orange-pink (Figure 5). Watch Sintering Video.

Clean Up & Maintenance

After printing screens should be cleaned (within up to 2 hrs.) to avoid copper contamination on the mesh.

Screen printing instructions:

1.Wipe off any remaining Copper ink with a paper towel.
2.Wet both sides of the screen with Dowanol DB solvent.
3.Gently wipe the screen in a circular motion with a wet soft fabric to ensure removal of all ink remnants and that the screen is softened.
4.Wash the screen with tap water. Wet screen areas that have remaining ink with Dowanol DB solvent.
5.Gently wiping with a wet soft fabric in a circular motion, rub till remainder of formulation is softened (the liquid will turn dark).
6.Wash screen again with tap water to remove solvent and paste traces.
7.Inspect screen to ensure mesh is clean.
8.In the event the screen patterns are still clogged with ink residue, consider repeat cleaning procedure until screen is clean.
9.Dry the clean screen with paper or dry fabric and leave it to dry.

Disclaimer
IPS is not responsible for misuse of its products or their use in conjunction with unsafe or improperly maintained equipment or for uses other than intended as specified in this application note.
Product MSDS, Product TDS can be found at IPSS.SHOP resources.

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IK-370 – paste for FR4 and Alumina substrate

IK-370 Nano Copper Ink for high conductivity additive screen printing on

FR4. Technology: Screen printing
Appearance: Copper paste Filler Type: Copper Substrate: Paper

Key Product Benefits • Ultra high conductivity
- Excellent adhesion
- Very-low fabrication cost, efficient (no material waste)
- Hybrid ink – Micro and nano Cu particles.
- Excellent printability with screen printing
- Rapid self-sintering, really simple fabrication in air environment • Non toxic, green circuits, environmentally friendly

Drying: Ceramic lamps/hot air/thermal plate/oven
Sintering: Hot press, hot plate conveyor
Application: Conductive Nano Copper Ink for Additive Printing Common Application: FPCB and PCB

TYPICAL PROPERTIES: UNCURED NANO COPPER PASTE

Particle Size, µm <0.15

Average particle Size, µm D50 < 0.15, D90 < 5.0
Solids Content, after 30 minutes @ 150ºC, % 85-90
Density, g/ml 3.7
Viscosity @ 250C , DVEHA Brookfield spindle 14,
100rpm, mPa·s (cps) 6000-8000

Theoretical coverage @ 8 µm dry film thickness, 12 m²/kg
Shelf Life @ -10°C, days 180
Flash Point – See SDS

Flash oint – See Safety Data Sheet (SDS)

Drying and Sintering:
Copper IF-370 may be dried employing dry hot air, (near) infrared or ceramic

lamps.
Drying cycle: 15 sec @150°C (Ceramic lamps)
Sintering cycle: 5 sec @300°C (R2R laminator) or 5-30 sec @ 280-320°C (Heat press)
*Conditions (time / temperature) may vary based on application requirements, drying equipment, oven loading and actual temperatures.

TYPICAL PROPERTIES: CURED NANO COPPER PASTE

Adhesion: tape test 3M Scotch 234 (Passed)

Cross cut test ISO 2409-2007 5b

Electrical Properties: Sheet Resistance, ohm/□/25 µm <0.0025

DIRECTIONS FOR NANO COPPER INK USE

Copper ink IK-370 is supplied as a single-component formulation ready for use.

SCREEN PROPERTIES

Emulsion, Solvent resistant emulsion: 10 to 40 µm
Squeegee Shore Hardness: 70 to 90 Shore
Screen Type: Polyester screen, mesh 90 to 200 Shore

EQUIPMENT MAINTENANCE & CLEAN-UP

Equipment can be cleaned with Dowanol DB followed by aqueous solution which includes 10-20% w/w 2-amino-2-methyl-1-propanol.
See Application Notes.

STORAGE AND HANDLING

Store sealed container under -10°C in a dry location.
(Storage above 30°C can adver-10sely affect product properties.)

Paste removed from containers may be contaminated during use. Do not return Paste to the original container. Copprint is not responsible for paste which has been contaminated or stored under faulty conditions

SAFETY INFORMATION

For safe handling of Copper Nano Ink consult the MSDS

TECHNICAL DATA SHEET

For technical data please see the Technical data sheet