

Metalon® Conductive Inks for Printed Electronics

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Metalon® SPI-502GL Conductive Silver Spray Ink

Product Description

SPI-502GL is a water-based, silver nanoparticle spray ink which is specifically designed for glass and transparent conducting oxide (TCO) surfaces. It has been specifically formulated to produce cured films with high conductivity, good adhesion, low surface roughness, and semi-reflective appearance. SPI-502GL can also be used as a seed layer for electroplating various metals.

Key Benefits

- Excellent flow properties and spray coverage
- High electrical conductivity at low cured film thicknesses
- Good adhesion on glass and transparent conducting oxide (TCO) surfaces
- Good adhesion on treated PET films and polyimide
- Used as a seed layer for metal electroplating
- Easy clean up with particle-free detergent and water

Typical Ink Properties

Silver content (wt. %)	50 (± 2)
Density (wet)	1.8 - 2.0 g / mL
Viscosity	30 - 60 cP
pH	5.70 to 5.95
Shelf life with refrigeration	> 8 months (may need pH adjustment)

Thermal Processing Conditions and Properties of printed films on selected substrates¹

	Indium Tin Oxide (ITO) on glass		
Cure temperature (°C)	100	140	200
Cure time² (min)	≥ 30	≥ 15	≥ 5
Weight resistivity³ (gΩ / m²)	0.50 (3.0x bulk Ag)	0.45 (2.7x bulk Ag)	0.39 (2.3x bulk Ag)
Volume resistivity⁴ (μΩ cm)	11 (6.7x bulk Ag)	8.7 (5.5x bulk Ag)	7.4 (4.7x bulk Ag)
Sheet resistance at 1 mil (mΩ / square)	4.2	3.4	2.9

	Fluorinated Tin Oxide (FTO) on glass		
Cure temperature (°C)	100	140	200
Cure time² (min)	≥ 30	≥ 15	≥ 5
Weight resistivity³ (gΩ / m²)	0.48 (2.9x bulk Ag)	0.42 (2.6x bulk Ag)	0.38 (2.3x bulk Ag)
Volume resistivity⁴ (μΩ cm)	9.9 (6.3x bulk Ag)	8.3 (5.2x bulk Ag)	7.9 (5.0x bulk Ag)
Sheet resistance at 1 mil (mΩ / square)	3.9	3.3	3.1

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	Glass			
Cure temperature (°C)	100	120	140	200
Cure time ² (min)	≥ 30	≥ 15	≥ 15	≥ 5
Weight resistivity ³ (gΩ / m ²)	0.50 (3.0x bulk Ag)	0.46 (2.8x bulk Ag)	0.44 (2.6x bulk Ag)	0.39 (2.4x bulk Ag)
Volume resistivity ⁴ (μΩ cm)	11 (6.7x bulk Ag)	9.6 (6.1x bulk Ag)	8.2 (5.2x bulk Ag)	7.7 (4.9x bulk Ag)
Sheet resistance at 1 mil (mΩ / square)	4.2	3.8	3.2	3.0

	Glass	
Cure temperature (°C)	250	275
Cure time ² (min)	≥ 5	≥ 5
Weight resistivity ³ (gΩ / m ²)	0.39 (2.3x bulk Ag)	0.36 (2.1x bulk Ag)
Volume resistivity ⁴ (μΩ cm)	7.4 (4.7x bulk Ag)	6.9 (4.3x bulk Ag)
Sheet resistance at 1 mil (mΩ / square)	2.9	2.7

	Melinex ST505, a type of treated PET		
Cure temperature (°C)	100	120	140
Cure time ² (min)	≥ 30	≥ 15	≥ 15
Weight resistivity ³ (gΩ / m ²)	0.44 (2.6x bulk Ag)	0.43 (2.6x bulk Ag)	0.40 (2.4x bulk Ag)
Volume resistivity ⁴ (μΩ cm)	9.7 (6.1x bulk Ag)	8.9 (5.6x bulk Ag)	8.1 (5.1x bulk Ag)
Sheet resistance at 1 mil (mΩ / square)	3.8	3.5	3.2

	Kapton HN, a type of polyimide			
Cure temperature (°C)	140	200	250	275
Cure time ² (min)	≥ 15	≥ 5	≥ 5	≥ 5
Weight resistivity ³ (gΩ / m ²)	0.38 (2.3x bulk Ag)	0.35 (2.1x bulk Ag)	0.34 (2.0x bulk Ag)	0.33 (2.0x bulk Ag)
Volume resistivity ⁴ (μΩ cm)	8.0 (5.1x bulk Ag)	7.3 (4.6x bulk Ag)	6.8 (4.3x bulk Ag)	6.4 (4.0x bulk Ag)
Sheet resistance at 1 mil (mΩ / square)	3.2	2.9	2.7	2.5

¹The theoretical wet ink thickness for all prints was 51 μm. All prints were cured in a convection oven.

²The tabulated cure times (for a given cure temperature) are shown as a range of times. This is indicated by the use of the “≥” sign. In this range of cure times, the tabulated values of weight and volume resistivity, and sheet resistance at 1 mil are the same.

³The number in brackets for each entry is the weight resistivity value divided by the weight resistivity of bulk silver (at 20°C).

⁴The number in brackets for each entry is the volume resistivity value divided by the volume resistivity of bulk silver (at 20°C).

General Processing Guidelines

- In order to achieve best adhesion for cure temperatures ≥ 200°C, a two-step heating procedure is recommended. The first cure step should be at a lower temperature, for example 140°C. The second cure step will be at the target cure temperature.

For more information about this ink, please contact us at info@novacentrix.com