DuPont Microcircuit Materials

APP21 Silver Carbon Conductive Composition

Thick Film Composition

All values reported here are results of experiments in our laboratories intended to illustrate product performance potential with a given experimental design. They are not intended to represent the product's specifications.

Product Description

Silver/carbon APP21 shows greater resistance to silver migration than conventional polymer silver chemistries and is recommended for high volume appliance switch applications. Wide processing latitude allow it to be used on flatbed and reel-to-reel manufacturing lines.

Product Benefits

- Excellent high temperature stability

Processing

Screen Printing Equipment
Reel-to-reel, semi-automatic, manual

Ink Residence Time on Screen
>1 hours

Screen Types
Polyester, stainless steel

Typical Cure Conditions
Box oven: 120°C for 5-6 minutes
Reel-to-reel: 140°C for 1minutes

Typical Circuit Line Thickness Printed with 325-mesh stainless steel screen
8-9 microns

Clean up Solvent
Ethylene glycol diacetate

Storage and Shelf Life

DuPont thick film polymeric compositions should be stored at ambient temperatures. Shelf life of material in unopened containers is six months from date of shipment. Some settling may occur, so compositions should be stirred thoroughly before use.

Table 1
Typical Physical Properties
on 5-mil Polyester Film

Sheet Resistivity (mΩ/sq/mil)	≤ 35
Abrasion/Tape Pull (3M Scotch Tape #810)	No Material Transfer
Abrasion Resistance, Pencil Hardness (H) (ASTM D3363-74)	3H
Operating Use Temperature (°C)	≤ 90
Solder	Not Recommended

* Environmental Tests
• Thermal Shock (+85°C to -40°C, 30 min. each, 5 cycles)
• Dry Heat (+85°C, 20 days)
• Humidity (+60°C, 95% RH, 10 days) [MIL Std 202E, method 103, cond. A]
• Salt Spray (+35°C, 5% salt, 10 days) [ASTM B117]
• Silver Migration (10 VDC, 40ºC, 90% RH, 500 hr, tested on 40 and 70-mil gaps)
• Sulfate Dioxide (+45°C, 90% RH, 500 hrs in a 9-liter chamber containing 500 mg of flowers of sulfur)

Table 2
Composition Properties

Viscosity (Pa.S) (Brookfield RVT#14, 10 rpm spindle, 25°C)	80 - 140
Solids (750°C)(%)	53-56
Coverage (cm²/g) (Dependent on screen size and material)	140-300
Thinner	8210

Safety and Handling

DuPont thick film products are intended for industrial use by trained personnel. These products contain organic and inorganic ingredients. It is important for workers to avoid overexposure to chemicals contained in these products or that might be become available when processing them. Overexposure to other materials used in the operation should also be avoided, for example, cleaning solvents and degreasing fluids.

Well-designated area and personal air sampling/ analysis can show if exposures are within required and recommended limits. Properly designed engineering controls, such as local ventilation and process enclosures, are effective in limiting employee exposure and to avoid the creation of hazardous conditions (e.g. forming an explosive vapor concentration). Engineering controls and procedures must comply with all applicable federal, state and local safety, health and environmental laws and regulations.

The following additional precautions should be taken when handling these products:

- Read the Material Safety Data Sheet (MSDS) and product labels before using the products;
- Use appropriate personal protective equipment (PPE) and practice good industrial hygiene. DO NOT INGEST! DANGEROUS IF SWALLOWED!
- Keep product container closed when not in use to prevent solvent evaporation and spilling hazards;
- If contact with skin occurs, wash affected area immediately with soap and water;
- Avoid prolonged breathing of vapors and dust/particulates. Keep exposure levels within the required or recommended limits. Always use sufficient ventilation as noted above.

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