



DuPont Electronic Materials

5018A UV Curable Dielectric

Thick Film Polymeric 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, details of which are available upon demand.

Product Description

Polymeric dielectric composition 5018A is a colourless UV-curable, solventless, screen printable composition used in encapsulant and crossover applications for both rigid and flexible circuit manufacture. It offers the advantages of rapid cure and excellent processing latitude while maintaining excellent electrical and physical properties after cure, including excellent crosshatch adhesion to print-treated and good adhesion to non-print-treated PET substrate and conductor. It is fully compatible with DuPont's 5000 series compositions.

Processing

- Screen Printing Equipment**
Semi-automatic and manual
- Substrates**
Polyester, polyimide, epoxy-glass
Suitable for non-print-treated polyester
- Ink residence Time on Screen**
> 2 hours
- Screen Types**
Polyester, Stainless Steel (SS)

Dielectric Design Considerations

5018A is an excellent encapsulant and protective overcoat. For such uses, a single print achieving 15µm above the underlying conductor will generally suffice. In more demanding crossover applications or when electrical isolation is critical, at least two separate print/cure passes are mandatory, with total thickness over the highest underlying conductor 25µm. In all cases, the design must be tailored to the specific circuit requirement.

Printing

Dielectric Composition 5018A should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean, burr-free spatula (flexible plastic or stainless steel) for 1-2 minutes. Printing should be carried out in a clean, well-ventilated area. Additional information on requirements for printing areas is contained in DuPont Technical Guide, EUT 7.3 "Processing-Screen Printing Rooms", available on request.

Note: optimum printing characteristics of 5018A are generally achieved in the temperature range 20°C-23°C. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing.

UV Curing

The effectiveness of UV curing is dependent on many equipment and UV lamp parameters, as well as on the temperature and energy density. Therefore, no global recommendations can be made. In each case, the process must be optimized on the available equipment. It is recommended that weekly process checks be carried out using an appropriate radiometer to monitor the UV energy output.

The UV energy required to achieve optimum density, flexibility and adhesion will vary depending on the wavelength and the nature of the underlying layers. It is recommended to begin with 500 mJ/sqcm using (80 W/cm) medium pressure mercury vapour lamps and vary to determine the minimum cure necessary to achieve maximum adhesion. The suggested cure is typically 20% above that energy value in order to provide a safety margin.

Table 1
Exemplary Physical & Electrical Properties on Polyester Film

Adhesion Crosshatch (ASTM D3359-78)	
Dielectric to Polyester Scotch Tape #600	No transfer (5) B
Conductor to dielectric	No transfer
Abrasion resistance	1H
Pencil Hardness (ASTM D3363-74)	
Operating use temperature (dependent on conductor)	70 °C
Flexibility (180° crease over 5007E)	No opens
Breakdown Voltage (DC) (ASTM D150)	>20V/μm
Dielectric Constant (ASTM D150)	< 5 @ 1 kHz
Insulation Resistance	>10 G /□/25μm
Change in Physical Properties after Environmental Tests*	Insignificant
Change in Insulation Resistance After Environmental Tests*	May drop up to one order of magnitude

* Environmental Tests

- A. Thermal Shock (+85°C to -40°C, 30min each 5 cycles)
- B. Dry Heat (+85°C, 10 days)
- C. Humidity (+40°C, 95% RH, 10 days) (MIL Std 202E, method 103 cond A)
- D. Salt Spray(+35°C, 5% salt, 10 days) (ASTM B117)

In multiple print processes typical of crossover applications, some users achieve best composite performance by softer (e.g. 20% lower energy exposure) cure of the first print. This may be optimized by measurement of adhesion and abrasion after each pass.

General

Yields and performance will depend to a large degree on the care exercised during processing, particularly in screen printing. Scrupulous care should be taken to keep the dielectric composition, printing screens and other tools free of metal contamination. Dust, lint and other particulate matter may also contribute to poor yields.

Compatibility

Whilst DuPont has tested this composition with specified materials and under the recommended processing conditions, it is impossible or impractical to cover every combination of materials, customer processing conditions and circuit layout.

Table 2
Exemplary Composition Properties

Viscosity Pa.s (Brookfield HBT, 10 rpm, # 14 Spindle ,25°C)	25-45
% Solids after cure	100
Coverage, cm²/g (Dependent on screen size and material)	
77T PET (17μm)	330
200 mesh/in SS (28μm)	240
Thinner	Not recommended
Density (g/cm³)	1.28
Colour	Colourless
Odour	Slight, pleasant

It is therefore essential that customers thoroughly evaluate this material in their specific situations, in order to completely satisfy themselves as to the overall quality and suitability of the composition for its intended application(s).

Storage

Containers of 5018A may be stored in a clean, stable environment at room temperature (<25°C), with their lids tightly sealed. Storage in freezers (temperature <0°C) is NOT recommended, as this could cause irreversible changes in the material. UV curable compositions such as 5018A should be stored away from heat and light. Jar rolling is unnecessary and is NOT recommended, as this could change the rheology of the material.

Shelf life

Dielectric Composition 5018A has a shelf life of 6 months from date of shipment, for factory-sealed (unopened) containers, stored under room temperature conditions.

Health/Safety considerations

DuPont polymer compositions are intended for use in an industrial environment by trained personnel. All appropriate health/safety regulations regarding storage, handling and processing of such materials should be complied with.

For information on health/safety regulations, please refer to the specific MSDS for 5018A and to the DuPont Safety Guide EUT 7.1 "Practical Safe Handling of Thick Film Compositions".

This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experimentation. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge and experience become available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right. **Caution : Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement", H-50102.**

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