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Micromax™ 4817N

Microcircuit and Component Materials

Conductive Silver Compositions For General Purpose Air-Dry Applications

The compositions described in this bulletin are suspensions of specially prepared silver powders combined with a variety of organic binder systems. They are air-dry or low temperature-curing formulations for application on substrates which will not generally tolerate high-temperature firing. They are formulated to produce electrically conductive paths on paper, plastic, rubber, cloth, wood, etc., and may be applied by dip, spray, brush, stylus, syringe or screen print.

These highly conductive air dry/thermoset (epoxy) compositions exhibit versatility and are useful over a broad range of applications. Suggested uses are:
• Printed Electronics
• Tantalum Capacitors
• Static Shielding
• Electrical Games and Toys
• Microwave Applications
• PC Board Repair
• Electroplating Base

Choice of an air dry or thermosetting conductive silver composition for a given use is dependent upon the method of application preferred and the required properties in the end product. Trade-offs in final film properties are sometimes necessary.

Drying rate is a function of the solvent system in a composition and method of application is dictated by viscosity, a function of binder to solvent ratio.
Dry strength, flexibility, adhesion and temperature stability are functions of the binder system. No one binder system exhibits optimum capabilities of all functions. Lower metal contents are generally least expensive if cost is a primary consideration. Higher metal contents develop maximum conductivity and load carrying capabilities, and are more easily soldered.

Product information

Solvent or thinner	Micromax™ 8459

Rheological properties

Viscosity	0.22 - 0.28[1] Pa.s

[1]: Brookfield LVT, #2 spindle, 60 rpm

Application technique

Theoretical coverage	120[2] cm^2/g

[2]: Dip/Spray, at 50µm wet film thickness

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Electrical properties

Surface resistivity	≤100[3]	mOhm per square

[3]: Dip/Spray, at 25µm film thickness

Storage and stability

Shelf life	3[4]	months

[4]: in unopened containers, from date of shipment, at room temperature

Additional information

How to use

Design & compatibility

- Design
  - Micromax™ 4817N conductive silver compositions exhibit a moderately fast drying rate, good adhesion to most substrates and high conductivity. They are used to produce electrically conductive patterns on surfaces of paper, film, plastic, rubber or wood as well as on conventional ceramic substrates. They are widely used in the manufacture of tantalum capacitors to metallize the anode, making it a good electrical contact.
  - For dip, spray, brush or screen print application, Micromax™ 4817N compositions can be cured in 16-20 hours at room temperature (25°C) or may be oven cured in 1 hour or less at 60-100°C.
  - Micromax™ 4817N, for spray or dip application, is widely used in electroforming, in electroplating, in static shielding, in magnetic tapes and in the manufacture of tantalum capacitors. Its low metal content places Micromax™ 4817N in a moderate price range attractive for many applications.

Processing

- Application methods
  - Micromax™ conductive silver compositions are formulated for application by screen printing, spraying, dipping, brushing, banding or stylus. In most cases the compositions are produced to a consistency suitable for use as received and require only stirring to redisperse the solids.
  - Recommended thinners for individual compositions may be added, with thorough blending, to replace solvent losses or to make slight adjustments for ease of application. Only the recommended thinner should be used. In handling and using organic solvents, the safety precautions recommended by the

solvent supplier should be observed.

- Curing
  - 1 hour at 60°C
- Effect of curing temperatures
  - This bulletin discusses two types of compositions: air dry and thermoset (epoxy). In an air-dry system, the metal-binder film is formed when the solvent system is evap-orated or "dried". In a thermoset system, there is a drying step where the solvent is removed, followed by a chemical reaction of binder materials in the system to give a higher temperature resistant binder film for the metal. The later chemical reaction is called "curing" and is different than drying.
  - While some compositions, if given sufficient time, will adequately dry or cure at room temperature, a more effective result is achieved in much less time through low temperature thermal exposure with a moderate time/temperature drying or curing. Optimum properties in air & dry and low-temperature-cure compositions are developed only after the compositions have been properly dried or cured. The drying or curing cycle for most compositions in a function of time versus temperature up to the point of degradation of the organic system. In a system which will dry or cure in from 12 to 16 hours at room temperature (25°C) the same degree of drying or curing can be achieved in less than 2 hours at 60°C and in less than 1 hour at 100°C.
  - Elevated temperature drying or curing of these compositions can be continuous, box oven or infrared. The heat should be applied from the bottom up to permit internal gases to escape before the top surface is completely dry. "Flash drying", a momentary exposure to excessively high temperatures, is likely to from a surface skin that traps internal gases, resulting in bubbles in the dried film.
  - Failure to achieve rated conductivity indicates either that the applied composition is too thin with poor uniformity or that it has been incorrectly dried and/ or cured.
- Soldering
  - Some Micromax™ air dried and thermoset compositions are more commonly used as conductive cements in lead attachment, attachment of discrete components or in simple interconnections. For these applications, solderability is not important and is not generally recommended.
- Electroplating/Electroforming
  - The use of Micromax™ air dry/thermoset conductive silver compositions as bases for electroplating and electroforming is wide-spread. Ease of application, broad curing ranges, high conductivity and dimensional stability mark Micromax™

4929N, 4922N and 4817N compositions as leaders in the field.

- Coverage
  - Coverage of silver compositions depends on metal content and thickness of application. Screen print compositions printed with a 165 or 200-mesh screen will generally result in a cured film 12-20µm (0.48-0.8mil) thick. Brush band, dip or spray application will normally result in film thickness of 13-18µm (0.5-0.7mil). Thinner films (increases coverage) can be applied by thinning the compositions with the recommended thinner; however, this will result in a cured film with a higher sheet resistivity. Thicker films can be achieved by brushing or spraying simply by applying more material.
  - The coverage Micromax™ 4817N compositions are for typical cured thickness of 12-20µm (0.48-0.8mil) as outlined above.

Storage and shelf life

Micromax™ 4817N compositions (air-dry) should be stored at room temperature. Shelf life of material in unopened containers is three months from date of shipment.

Safety and handling

For safety and handling information pertaining to this product, read Safety Data Sheet (SDS).

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