Product Data Sheet

MicroCoat Technologies
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Unparalleled in Polymer Coatings and Adhesives Technology

Product

MCT 2-0404/33-HTC

A Very High Thermally Conductive Die Attach Adhesive at >11W/mK - ***100% Solids*** and Used Consistently at Over 60GHz

With over 25,000 hours of rigorous testing and many thousands of hours in actual operation in both Military and Medical Microelectronic Devices, MicroCoat **2-0404/33-HTC,** a 100% solids one part highly Thermally Conductive thermosetting conductive epoxy ***(>11W/mK)*** is designed primarily for die attaching large or very small die with mismatched thermal expansions in Military, Medical, “down-the-hole” hybrids, optoelectronics, automotive sensors, etc. A “Sister” formulation to MCT’s SD0802/31 for 3D Stacked Devices, this material is a thixotropic paste which may be applied by stencil printing or syringe. It is 100% solids, and posses’ good handling and storage properties. This silver-filled conductive die attach adhesive is designed to bond ICs and components to advanced substrates such as ceramic, PBGAs, CSPs, LCP, and array packages with *virtually no bleed*. Hydrophobic and stable at high temperatures, the adhesive produces a void-free bond line with excellent interfacial adhesion strength to a wide variety of organic and metal surfaces including solder mask, BT, FR4, LCP, polyimide, gold, Kapton and Mylar. This material is formulated to provide high cohesive energy, adhesive strength, *stress absorbing for large die*, and elongation at break. Short term at >300^{o}C (2-3 minutes for Pb free reflow) if cured at 150^{o}C for 60 minutes

Composition Properties

Filler Contents:	85%-88% Silver
Viscosity:	20-35 Kcps @ 10 RPM Brookfield HBT CP51 cone and plate.
Thixo Ratio at above viscosity parameters	1.25 – 2.55
Average Particle Size:	<.70 – 1.25 microns

Typical Cured Properties[2] at Minimum Bond Line of 32 Microns

Volume Resistivity:	**<0.000055 Ω-cm**
****Thermal (Interfacial) Conductivity**	**11.0 – 11.9 W/mK**
T_g ^{o}C	260
CTE Below Tg in/in^{o}C	21.0X10^{-6}
Above Tg in/in^{o}C	32X10^{-6}
Die Shear Kg (150C 1 hour cure)	>9.7 @ RT (>4.6 @ 150C)
Die Shear Kg (150C 1 hour cure)	>9.46 after 200C assembly operation
Die Shear Kg (150C 1 hour cure)	>9.05 after 280C assembly operation (Eutectic component attach)
Shore “D” Hardness	75 - 80
Post Cure Ionics 883/5011.3.8.7	Cl=<6ppm, Na+=<3.3ppm, K+=<1.1ppm

Teflon Flask 5 gm sample using 20-40 mesh, 50 gm DI H_2O, 100^{o}C for 24 hours

Modulus:

@65C =	5595 MPa;
@25C =	5510 MPa;
@150C =	925 MPa;
@250C =	310 MPa

Thermal conductivity vs. thermal impedance in adhesive bondlines. Although some adhesive manufacturers may claim to have bulk thermal conductivity values higher than 30 W/m°K, device manufacturers need to appreciate that the bulk value is only an indicator of potential for heat transfer through the adhesive bondline. The material with the lowest thermal impedance should actually be the goal, as it is with this that the best heat transfer can actually be obtained. The factors that affect thermal impedance include: adhesion at the interface, surface wetting, thin adhesive bondlines and void-free bondlines. If the interfacial adhesion is weak or impacted by filler alignment or solvent, then the thermal resistance across the interface will be so great that the bulk resistivity becomes meaningless. If the bondline can be kept thin, for example ***by using a solventless adhesive*, then heat transfer will be very efficient regardless of the difference in the bulk thermal conductivity.

More than 20 major mil customers have certified this material to 883/5011 table 1 requirements

TABLE I. Requirements

Test or Condition	Test Method Paragraph	Adhesives				α Absorbers				Film Dielectrics 1/				Particle Getters			
		Supplier		User		Supplier		User		Supplier		User		Supplier		User	
		A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Materials (3.4.1)	3.8.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Viscosity (3.4.2)	3.8.2	X	X			X	X			X	X						
Pot Life (3.4.3)	3.8.3	X	X			X	X			X	X						
Shelf Life (3.4.4)	3.8.4		X				X				X				X		
Thermogravimetric analysis (3.5.2)	3.8.5	X	X			X	X				X			X	X		
Outgassed materials (3.5.3)	3.8.6				X				X				X				X
Ionic impurities(3.5.4)	3.8.7	X	X			X	X				X				X		
Bond strength (3.5.5)	3.8.8	X 2/	X				X										
Coefficient of linear thermal expansion (3.5.6)	3.8.9		X														
Thermal conductivity (3.5.7)	3.8.10		X														
Volume resistivity (3.5.8)	3.8.11		X														
Type 1 materials		X 2/	X														
Type 2 materials			X			X	X			X	X						
Dielectric constant (3.5.9)	3.8.12		X								X						
Dissipation factor (3.5.10)	3.8.13		X								X						
Sequential test environment (3.5.11)	3.8.14				X				X				X				
Density (3.5.12)	3.8.15																
Mechanical integrity (3.5.13)	3.8.16																X
Operating life test (3.5.14)	3.8.17																X

A= Performed at acceptance testing.
C= Performed at certification testing.

1/ Film dielectrics are defined as polymeric materials that are used in film form to act as either interlayer dielectrics, passivation layers, and/or circuit support films.
2/ Required at 25°C test condition only. No high temperature storage required.

Processing Procedures: Mixing: The material should be lightly stirred prior to use if used from a jar. Not required if in a syringe.

Application: The material may be applied by screen or stencil printing or syringe dispense. **Curing:** Cure at 150°C for 60 minutes. Optimum conditions will vary depending upon application and will need to be determined experimentally. Alternate cure schedule is 2-3 hours at 80°C - 125°C depending on substrate.

Storage MicroCoat 2-0404 should be stored in sealed containers away from heat or flames. It has a shelf life of 7-9 days at a storage temperature of 25°C, 4-6 months at -10°C or 9-12 months at -40°C.

DO NOT STORE AT TEMPERATURES BELOW -40°C. Material ***may*** be returned to refrigerator/freezer after using partial syringes or jars.

Packaging: 3cc and 10cc syringes. **Shipping:** Product is shipped FedEx overnight only in Styrofoam Freezer Packs - Monday – Thursday only in the US and Monday only to Europe or Asia.

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