TCL-202

Thermal Conductive Dual-Curable Epoxy Adhesive

PRODUCT DESCRIPTION:

- Base chemistry: epoxy only, cationic polymerization
- One component Boron Nitride filled non-electrically conductive adhesive ready for use, UV + heat curing.
- Average particle size 7 µm and max size 30 µm

PRODUCT USE:

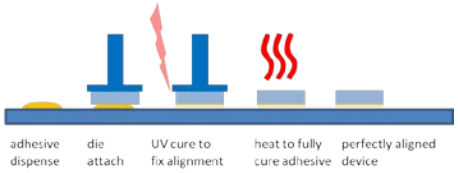
- Bonding integrated circuits and components in semiconductor packaging.
- Heat transfer and dissipation
- Bonding of opaque substrates

FEATURES:

- Thermal conductive, electrical insulating, high adhesion, high Tg, long shelf and working life, low outgas, excellent reliability performances, robust for solder reflow process

INSTRUCTIONS FOR USE:

1) Clean the substrates to remove contamination.
2) Dispense adhesive on substrates
3) Bond substrates
4) UV cure to fix alignment
5) Thermal cure: heat is mandatory for completely cured adhesive



CURING CONDITIONS: 2 curing ways: UV + heat or heat

1) **UV + Heat curing**: fix aligned parts with UV, then use heat to completely cure adhesive including adhesive in shaded areas.

First step: UV cure

*Metal halide/Mercury UV: UV-A (320-400 nm),intensity: 100-1,000 mW/cm^2

*LED-365 nm, UV light intensity: 100 to 1,000 mW/ cm^2

LED-365 nm		Metal Halide/Mercury(UV-A: 320-400 nm)	
UV intensity(mW/cm^2)	x time (sec)	UV intensity(mW/cm^2)	x time (sec)
100	100 sec or more	100	50 sec or more
or 200	50 sec or more	or 200	25 sec or more
or 300	35 sec or more	or 300	17 sec or more
or 400	25 sec or more	or 400	13 sec or more
or 500	10 sec or more	or 500	10 sec or more
or 1,000	5 sec or more	or 1,000	5 sec or more

Second step: heat cure: the adhesive is exposed to UV light first, then heat cure

* 90 °C for 60 to 90 minutes

2) **Heat curing**: the adhesive will cure by only heat

90°C for 60 to 90 minutes or 100°C for 60 minutes or 110°C for 45 to 60 minutes

- The actual heat cure time is dependent on the heating time of the bonded components. The heat time of the components must be added to the total cure time of the adhesive for the process
- The effect of humidity is greater for very thin film, if the adhesive layer is <25 µm, then longer cure time might be needed
- To ensure good curing speed, the humidity should be <60% RH
- Epoxy adhesives have post cure properties. Adhesion strength testing should be conducted at least 24 hrs after part assembly.

Thermal cure: heat is mandatory for completely cured adhesive

The maximum adhesion strength is achieved by HEAT cure. For best adhesion, UV fix cure should be kept at a minimum and the majority of the bonded components should be cured by HEAT

Addison Clear Wave Coatings, Inc., 3555 Legacy Blvd, St. Charles, IL 60174 USA

Tel: +1 630-444-1658, Fax: +1 630-444-1683, www.AddisonCW.com

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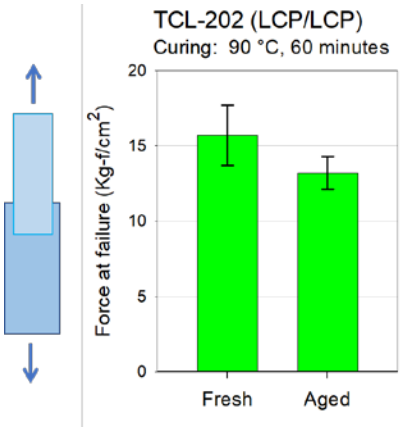
Reliability Study:



LCP/LCP bonded strip, 25 µm adhesive thickness
Heat cure 90°C 60 minutes
Fresh: test after bonding
Aged: test after aging at 110 °C + 100% relative humidity for 20 hours

TYPICAL PROPERTIES

Uncured resin	
Viscosity at 25 °C, mPa.s or cps (shear rate: 10/s)	30,000 to 34,000
Thixotropic index (shear rate: 1/s over 10/s)	3.5
Apperance of uncured adhesive	white paste
Shelf life (-40 to -20°C):	6 months
Pot life or working life (20 - 25°C):	48 hours
Density (g/mL)	1.3
Cured film	
Shrinkage (linear, %)	< 0.3
Hardness – Shore D	85-90
Outgas, weight % (per MIL-STD 883/5011)	0.11
Outgas, weight % (per Telcordia GR-1221)	0.07
Glass transition temperature (DMA, °C)	183
Volume Resistivity, ohm-cm	$>10^{13}$
Thermal Properties	
Thermal Conductivity:	2.8 W/m °K (75 µm film)
	1.2 W/m°K (500 µm film)
Coefficient of thermal expansion (DMA)	
below Tg ($x10^{-6}$), $°C^{-1}$	21
above Tg ($x10^{-6}$), $°C^{-1}$	60
Physical properties tested at 25°C, 50% RH (ASTM D638)	
Tensile strength, MPa	151
Elongation (%)	3
Young's Modulus, MPa	15,700
Operating temperature, °C	-60 to 200

GENERAL USAGE INFORMATION:

Shipment: adhesive is shipped in "cold pack with ice bricks", no Dri ice
Storage: After receipt, cold storage at -20 °C or -40 °C in the original container is required
Before use: The cold adhesive needs to reach RT (23-25°C) before use. The container needs to sit at RT, adding heat is not allowed. Room temperature equilibration time is dependent on container size, but a 10-30 gram syringe equilibration time is approximately 30-60 minutes. Condensed water on the container must be removed prior to use

SAFETY AND HANDLING

The uncured adhesive can be cleaned from apparatus with isopropyl alcohol (IPA), methyl ethyl ketone (MEK), or commercial alcohol based cleaning solution. Avoid direct skin and eye contact. Use only in well ventilated areas. Use protective clothing, **gloves and safety goggles**. Read Material Safety Data Sheet before handling.

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