Technical Data Sheet

Version 3, 2022

GLPOLY XK-D15L Double-component Non-silicone Thermal Conductive Structural Adhesive

Modified Epoxy Thermal Conductive Structural Adhesive

Description

XK-D15L double-component non- silicone thermal conductive structural adhesive is an advanced new concept material with rubber modified epoxy resin patent.It belongs to the epoxy system.

For the cure schedules, T_{10} provides enough time for reverse process. among which, cure schedule T_{10} provides a shear bonding strength of (0.5～1.0) MPa， allowing contact interface to be progressed or off-line.

At cure schedule T_{90}, the shear bonding strength reaches 90% of the maximum bonding strength. Shear bond strength reaches more than 6 MPa, bond interface can be in service.

XK-D20L combines functions of thermal conductive, electrical insulation, super bonding strength and sealing. It can simplify the engineering installation structure, reduce the manufacturing cost,decrease overall weight of the system and improve the assembly efficiency of automated production equipment, and it is easy to use.

Key Features

Thermal conductivity 1.5/m.K .

Eliminates the need of mechanical fasten,Suitable for simplify structural design such as CTP and CTC, reducing weight and increasing power battery energy density.

Tensile lap-shear strength ⩾8 MPa，withstands 12m free-fall with a speed of 120km/h disaster impact.

Flammability: UL 94-V0， self-extinguishes when removed from the fire source.

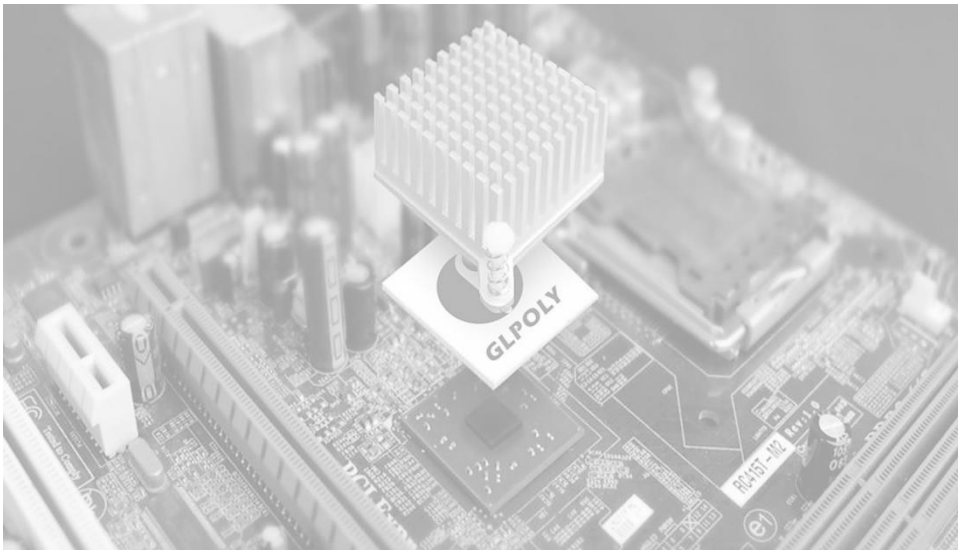
Application temperature -45℃，rated temperature 175℃,Short-term 250℃for 4h

Dielectric strength⩾10kV/mm, Typical Value can be 25 kV/mm.

Compatible with high volume, automated extruding processes.

Typical Applications

XK-D15L double-component non-silicone thermal conductive structural adhesive can be used for thermal conductive, electrical insulation, sealing and bonding of various lightweight super structures of electrical and mechanical systems, especially for highly integrated structural parts in new energy vehicles CTP &CTC power battery, aerospace, rail transit etc.



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Material Properties

Table 1 Physical, Chemical and Electrical Properties

No.	Items	Specimen Status	Unit	Specification		Typical value		Testing method
	Before mixing							
1	Color (Tolerance)	Before mixing	Part A	Natural color		Natural color		Office light Visual， PANTONE
		Before mixing	Part B	D15LAverage R255, G159, B189		D15L Pink		
				D15LDeep R253,G145, B175	D15LLight R255,G75, B200			
2	Viscosity	92#Rotor× 25 rpm	Part A	$125^{\pm25}$		126		ASTM D 2196 Brookfield Viscometer
		92#Rotor× 0.5 rpm		$1350^{\pm270}$		1370		
		92#Rotor× 25 rpm	Part B	$180^{\pm35}$		179		
		92#Rotor× 0.5 rpm		$1230^{\pm245}$		1240		
3	Density	Before mixing	Part A	$1.92^{\pm0.1}$		1.94		ASTM D 792
		Before mixing	Part B	$1.93^{\pm0.1}$		1.95		
4	Shelf life	@25℃	Months	≥6		> 6		UL 746B Viscosity and hardness method
	After mixing							
5	Appearance	After extruding	-	Thixotropic (toothpaste-like)		Thixotropic (toothpaste-like)		Visual
6	Mix Ratio	Package	V_a：V_b	1:(1±0.05)		1:1		Isochoric
		Maximum allowable mixed tolerance		1:(1±0.15)		1:(0.85～1.15)		
7	Viscosity	92#Rotor × 25 rpm	Pa.s	$150^{\pm30}$		155		ASTM D 2196 Brookfield viscometer
		92#Rotor × 0.5 rpm		$1280^{\pm250}$		1350		
8	Trixtropy Index	After extruding	-	>5		8.7		0.5 rpm viscosity/25 rpm viscosity Brookfield viscometer
9	Rate of extrusion	@25℃	ml/min （g/min）	$55^{\pm10}$ （$93^{\pm20}$）		54 （98）		Air pressure 83psi PM-13-24Air pressure 83Psi,PM-13-24 Static mixer
10	Pot life	@25℃	min	$120^{\pm25}$		115		Viscosity doubled but ≤460 Pa.s
11	Curing time (T_{10}&T_{90})	Curing temp	-	T_{10}	T_{90}	T_{10}	T_{90}	ASTM D 4473 10%/90%hardness method
		@10℃	h	$93^{\pm14}$	$180^{\pm26}$	91	184	
		@25℃	h	$12^{\pm2.0}$	$24^{\pm3.8}$	12	22	
		@40℃	h	$3.5^{\pm0.8}$	$6.0^{\pm1.3}$	3.0	5.0	
		@60℃	min	$60^{\pm10}$	$96^{\pm15}$	58	90	
		@80℃	min	$24^{\pm3.8}$	$45^{\pm6.6}$	22	41	
		@100℃	min	$12^{\pm2.0}$	$24^{\pm3.5}$	12	22	
		@125℃	min	$7.0^{\pm1.5}$	$12^{\pm2.3}$	7.0	11	

Continued to Table 1 Physical, Chemical and Electrical Properties

No.	Items	Specimen Status	Unit	Specification	Typical value	Testing method
	After curing					
12	Color (Tolerance)	Before aging	–	D15LAverage R255, G159, B189 D15LDeep R253,G145, B175 / D15LLight R255,G75, B200	D15L Pink	Office light,Visual, PANTONE
13	Density	Before aging	g/cm^3	$1.92^{\pm0.10}$	1.98	ASTM D 792
14	Thermal conductivity	Before aging	W/(m.K)	$1.5^{\pm0.1}$	1.48	ASTM D 5470
		Thermal aging ①			1.51	
15	Hardness	Before aging	Shore D	$76^{\pm6}$	70	ASTM D 2240
		Thermal aging			79	
16	Tensile strength	Before aging	MPa	≥8.0	11.3	ASTM D 412
		Thermal aging		≥8.0	12.3	
17	Elongation at break	Before aging	%	≥8	8.2	
		Thermal aging		≥5	6.3	
18	Secant modulus	Before aging	MPa	<1300	732	
		Thermal aging			770	
19	Shear bonding strength I AL-Gel-AL	Before aging	MPa	≥8.0	13.3（CF+AF）	ISO 4587
		Thermal aging		≥8.0	13.6（CF）	
20	Shear bonding strength II AL-Gel-Insulating varnish-Gel-AL	Before aging	MPa	≥6.0 Or aluminum plastic film cohesion damage	9.7（CF）	
		Thermal aging		≥5.0 Or aluminum plastic film cohesion damage	13.1（CF）	
21	Shear bonding strength III AL-Gel-aluminum-plastic film -Gel-AL（Coating interface bonding agent）	Before aging	MPa	≥6.0 Or aluminum plastic film cohesion damage	7.2 aluminum plastic film cohesion damage	
22	Shear bonding strength IV AL-Gel-PET-Gel-AL	Before aging	MPa	≥6.0	6.5（CF&AF）	
23	Breakdown strength	Before aging	kV/mm	≥10	12.6	ASTM D 149
		Thermal aging			13.5	
24	Volume resistivity	Before aging	Ω.cm	$\geq1\times10^{13}$	8.4×10^{13}	ASTM D 257
		Thermal aging			7.5×10^{13}	
25	The thickness of the construction （BLT）	After curing	mm	≥0.20	0.25	ISO 2360
26	Glass transition temperature	Before aging	℃	<-50 / >120	<-60 / 128	DSC or hardness method
27	coefficient of linear expansion	Before aging	1/K	$(1.4\sim4)\times10^{-5}$, @ -45℃～27℃; $(5\sim10)\times10^{-5}$, @ 27℃～195℃; $(1.0\sim2)\times10^{-5}$, @195℃～245℃	2.0×10^{-5}; 8.3×10^{-5}; 1.5×10^{-5}	ASTM E 831 or ISO 11359-2or Long-column method
28	Application temperature	Before aging RT75	℃	Power battery：-45～65 5G/6G：-45～175	-45～65 -45～175	ASTM G 166
29	Flammability	Before aging	-	V-0，self-extinguishes when removed from the fire source	V-0,self-extinguishes when removed from the fire source	UL 94
30	Prohibited substances	Before aging	-	Compliant SS 00259/RoHS	Compliant SS 00259/RoHS	SS 00259/RoHS
	Notes: ① Thermal aging——130℃× 4h,Sandwich biscuit samples for delivery inspection.					

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Durability Of XK-D15L : Service life >25 years. ***Test Methods, Algorithms and Utility for Aging Life of New Energy Battery Pack Thermal Management Composite Materials .*** **Patent number:CN202011645694.6, Please refer to The China Patent Office official website for details.**

Operating Procedures & Specifications

In fields such as aerospace, rail transportation and auto manufacturing, engineering components , in order to ensure that the bonding interface of high reliability,environmental adaptability, repeatability and reproducibility, The technicians have compared and tested with a variety of carefully tested schemes， strict operation process and specifications need to be formulated.

XK-D15L Double-component non-silicone thermal conductive structural adhesive and the above fields, should meet the conditions including but no limited to the following operating specifications, to ensure the consistency of bond strength:

1)Ambient temperature control.

Adhesive-dispensing temperature 25±3℃. Adhesive extrusion from screw temperature shall be 18 ~ 35℃..

2)Environmental humidity control.

Rh< 75%, professional grade instrument that needs to be calibrated. Household hygrometer purchased from supermarkets is invalid. When relative humidity exceeds the standard, moisture in the air is easy to adsorb on the work-piece or condense into invisible water film, and the incidence rate is very high in areas south of the Yellow River.

3) Cleanliness inspection.

White or light color dust-free cloth clean part with chemical pure 95% alcohol or anhydrous ethanol shall be used to wipe the bonding interface for many times (generally 3 times), until there is no visible gray or miscellaneous color on the dust-free cloth, from the beginning to the end of gluing, no unauthorized items and fingers are allowed to contact the gluing area; Keep open in standard dispensing environment for more than 30min.

4)Nose and mouth distance control.

When the distance between the mouth and nose of the glue-dispensing and installation personnel and the surface of the gluing part is less than 350mm, the mouth and nose must be away from the surface of the part for 9 seconds before glue-dispensing.

5)Contact taboo control.

After the cleanliness inspection of the workpiece, any person's body parts, gloves, work uniform shall not directly touch the surface of the glued parts,to prevent secondary contamination.

6)Time- efficient control.

After cleanliness inspection,the qualified work-pieces should be completed gluing within 4 hours. Pressing process should not stay overnight. It is to prevent atmospheric pollution components adsorption and to avoid condensing into the isolation film that difficult to clean.

7)Reference pollution sources.

For aluminum alloy, although there are many factors that can pollute the surface of parts, the ones occupying the front of the histogram are as following:Old osteoporosis rusty spot or oxide film, excess relative humidity, emergent oil pollution, hand sweat, fingerprints, nose and mouth breathed acid vapour condenses into film, urban vehicles exhaust (Sulphur and nitrogen oxide film, including a residual hydrocarbon containing aldehydes and ketonates condensate film), females' hand residual cosmetics (which have been detected many times).All above were key monitoring factors.

8) For 20L×2 200L ×2 packaging, after long- time storage， if a small amount of liquid oil is precipitated, After the cover is opened, the stirring paddle can be inserted into the deep layer of the glue surface, Stir slowly and evenly for normal use. While stirring ， air should be avoided at the lowest possible speed, or stir evenly in a vacuum environment. Firstly, stop stirring and then vent atmosphere.

Usage

a) Ensure compliance with standard operation procedures

In line with the operating specifications,directly dispensing can be qualified. For special bonding engineering , the interface bonding additives developed by Glpoly shall be applied .Its dosage shall be 3 ~ 9ml/㎡

Under standard environmental conditions, it takes about 15 seconds to apply glue after alcohol volatilizes itself.

b)Hand-held electric extruder dispensing

Cut the sealing film of the outlet, install the mixing tube, and extrude the product with a hand-held electric extruding gun, and apply it to the adhesive engineering surface.

c)Automatic dispensing

According to the optimized 3D extrusion path and procedure of Glpoly, starting the auto-dispensing machine can be qualified.

d)Curing procedures

At 25℃ 24h+80℃ 1h or at 25℃ 24h , the curing degree can be 90% which means T90 .

If you need to change the curing procedure, please consult our technical staff to ensure the quality and reliability of the bonding engineering.

Package and Storage

MPQ：Two-component: Part A and Part B, in four package specifications: 25mL× 2、200mL× 2、20L× 2、200L× 2; other non-standard package requirements will be assessed.if it works, it can be applied according to agreement.

Warehouse environment**:** T0≤35℃, Rh≤70%.

On-site Maintenance

Cured residue of XK-D15L double- component non-silicone thermal conductive structural adhesive is difficult to clean, all tools in contact with XK-D15L should be cleaned by hot water and soap or wiped with tissue before residue cures. Organic solvent such as alcohol is preferred for cleaning . Well ventilation shall be maintained and open fire shall be prohibited on-site.

Caution：

- Well ventilated in storage and transportation, keep out of sun and rain,
- In short term, max transfer temperature≤45℃, max transfer relative humidity≤95%.
- Flammability: UL94 V-0, self-extinguishes when removed from the fire source, storage and transportation as non-dangerous goods.
- Avoid contact with skin and eyes.
- Uncured thermal conductive structural adhesives shall not contact with food or utensils.

XK-D15L double- component non-silicone thermal conductive structural adhesive is harmless .When applied under safety measures, generally wearing impervious rubber or plastic gloves. Clean skin with tissue instead of towel. Keep on-site well ventilated.

Learn More

For additional information or Material Safety Data Sheets on the complete line of GLPOLY thermal interface management solutions, please call our office

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