ThreeBond

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ThreeBond Co., Ltd.

Technical Data
ThreeBond 3177
Light-curing adhesive (with moisture curability)

1. Product description

ThreeBond 3177 is a one-component non-solvent light-curing adhesive with moisture curability composed of an acrylic light-curing adhesive and an instantaneous adhesive. This adhesive has high durability and reliability of the acrylic light-curing adhesive and the quick curability and versatility of the instantaneous adhesive and is applicable to a wide range of materials and situations. Since the adhesive can cure in a short time under irradiation with UV light or visible light having a wavelength of 200 to 450 nm, it will be helpful in improving the production speed and saving energy. In addition, since it has moisture curability, it can cure with absorbed water in substrates or moisture in the air even in narrow gaps in which it is difficult to irradiate light to the adhesive. Also, it conforms to ISO10993 (biological safety assessment).

(Hereinafter, ThreeBond is abbreviated to TB.)

2. Features

(1) The resin cures under irradiation with UV light or visible light for several to several tens of seconds.
(2) The single-component adhesive need not be mixed prior to use.
(3) It is curable with light and moisture. It can be cured quickly with moisture on light blocking materials (metallic and colored materials) and with UV or visible light on areas to which light can be irradiated.
(4) Compared to general UV-curing adhesives, the adhesive can be cured at a lower UV dose (10 kJ/m^2).
(5) Excellent moisture resistance and heat resistance.
(6) Reduces working hours and improves line productivity.
(7) Strong adhesion to a wide range of materials.
(8) Conforming to ISO10993 (biological safety assessment).

3. Applications

(1) Fixing and bonding of light blocking materials (metallic and colored materials and plastics containing UV light absorber).
(2) Fixing and bonding of substrates which must be protected from heat damage.
(3) Fixing and bonding of supporting parts around optical lenses.
(4) Fixing and bonding of decorative materials.
(5) Bonding of parts which must be resistant to moisture and water.
(6) Bonding of window weather strips of cars.
(7) Bonding of other metallic, plastic and rubber materials.

4. Properties and characteristics

4.1 Properties and general characteristics of TB3177

Table 1 Properties and general characteristics of TB3177

Test item	Substrate	Unit	Result	Test method
Appearance	-	-	Yellow to transparent yellow green	3TS-2100-001
Viscosity	-	mPa·s	1200	3TS-2F00-001
Specific gravity (25°C)	-	-	1.06	3TS-2500-002
Set time (25°C, 50%RH) (Moisture curing)	NBR	sec	20	3TS-3140-001
	PC		60	3TS-3140-004
	Iron		90	
Curing conditions (UV light curing)	-	kJ/m^2	10	4kW High-pressure mercury lamp
Lap shear strength (25°C,50%RH) for 24hrs	NBR	MPa	0.8(*)	3TS-4100-011
	PC		5.8(*)	
	Iron		19.5	
Lap shear strength ($10kJ/m^2$)	PC	MPa	7.3(*)	3TS-4100-011

(Note) Set time and lap shear strength: As iron test pieces, sandblasted SPCC-SD was used. Other test pieces were used without treatment.
The conditions of lap shear strength test (25°C, 50%RH, for 24 hrs.) are moisture curing conditions. (10 kJ/m^2) is the UV dose for curing with a high-pressure mercury lamp.
(*) in the table indicates material failure of the substrate.

4.2 Adhesion to various substrates (substrates of same materials)

For the lap shear strength test, sandblasted metal test pieces were used. Other test pieces were used without treatment. The test pieces were bonded with the agent in an environment with a relative humidity of 50% at 25°C, and the agent was cured for 24 hours in the same environment. Then, the lap shear strength was measured at room temperature.

For the test with the use of TB3177 and TB7797, TB7797 (primer) was applied to the surfaces to be bonded and dried for 2 minutes before bonding the test pieces. Then, the adhesive was cured, and the adhesion was measured under the above conditions.

Test method: Lap shear strength (3TS-4100-011)

Table 2 Adhesion to various substrates (substrates of same materials)

Substrate	Lap shear strength (MPa)	
	Use of only TB3177	Use of TB3177 and TB7797
Iron	19.5	14.7
Aluminum	16.9	12.1
SUS	17.9	19.8
Brass	15.0	11.0
Copper	15.8	13.2
Nickel	17.8	10.4
Zinc chromate	5.6	3.6
Zinc die-cast	5.9	5.1
Hard PVC	2.6	4.4(*)
PC (polycarbonate)	5.8(*)	5.4(*)
Phenol	8.3(*)	8.6(*)
Nylon -6	4.8	4.7
Nylon -6,6	7.5	9.2
ABS (acrylonitrile-butadiene-styrene resin)	6.8(*)	7.3(*)
Glass epoxy	10.5	11.6
PBT (polybutylene terephthalate)	2.2	6.8
PET (polyethylene terephthalate)	9.6(*)	9.4(*)
PPO (polyphenylene oxide)	3.5	6.8
PPS (polyphenylene sulfide)	1.7	3.5
HIPS (high impact polystyrene)	4.2(*)	4.3(*)
Acrylic	4.7(*)	5.6(*)
Liquid crystal polymer (Vectra ®)	1.8	2.8
POM (polyacetal)	1.3	4.4
PE (polyethylene)	0.3	4.7(*)
PP (polypropylene)	0.4	6.5(*)
PTFE (polytetrafluoroethylene)	0.2	2.5 (*: Deformation)
Silicone rubber	0.3(*)	0.3(*)
NR (natural rubber)	0.4(*)	0.4(*)
CR (chloroprene rubber)	0.6(*)	0.6(*)
NBR (nitrile rubber)	0.8(*)	0.9(*)
SBR (styrene-butadiene rubber)	1.7(*)	1.8(*)
EPDM (ethylene propylene diene monomer)	0.7(*)	0.7(*)

Note: (*) in the table indicates material failure of the substrate.

4.3 Adhesion to various substrates (substrates of different materials)

PC (polycarbonate) substrates were bonded to substrates of various materials in an environment with a relative humidity of 50% at 25°C, and immediately the adhesive was cured by irradiating UV light at an UV dose of 30 kJ/m2 from the PC side. Then, the test pieces were left for 24 hours in an environment with a relative humidity of 50% at 25°C, and the adhesion was measured at room temperature. For this test, all substrates were used without any treatment.

For the test with the use of TB7797, TB7797 (primer) was applied only to the mating plastic surfaces, and the substrates were bonded after the primer was dried for 2 minutes. Then, the adhesive was cured with UV light, and the adhesion was measured as st

Test method: Lap shear strength (3TS-4100-011)

Table 3 Adhesion to various substrates (substrates of different materials)
[Lap shear strength (MPa)]

Substrate	Use of primer (TB7797)	TB3177	Existing our product (UV resin with moisture curability)
PC/aluminum	None	7.7(*)	2.4
PC/SUS	None	10.5(*)	3.1
PC/zinc die-cast	None	7.3(*)	2.8
PC/PPS	None	2.9	1.4
	With use of TB7797	4.8	-
PC/PBT	None	1.5	4.1
	With use of TB7797	5.8	-
PC/POM	None	2.4	1.1
	With use of TB7797	5.9(*)	-
PC/PE	None	0.4	0.4
	With use of TB7797	5.0(*)	-
PC/PP	None	1.0	0.8
	With use of TB7797	6.3(*)	-

Note: (*) in the table indicates material failure of the substrate.
For the abbreviations in the substrates column, see Table 2.

4.4 Characteristics of TB3177 after curing

Table 4 Characteristics of TB3177 after curing

Test item		Unit	Result	Test method
Linear expansion coefficient (0 to 100°C)	0 to 100°C	x 10^{-6}/°C	113	3TS-4740-001
	130 to 150°C		207	
Glass transition point (DMA, tanδ peak)		°C	119	3TS-4730-001
Hardness		-	D84	3TS-2B00-004
Dielectric breakdown strength		kV/mm	24.0	3TS-5230-001
Volume resistivity		Ω·m	9.2 x 10^{13}	3TS-5200-001
Surface resistivity		Ω	1.9 x 10^{15}	3TS-5200-002
Dielectric constant	1kHz	-	4.07	3TS-5220-001
	1MHz	-	3.52	
Dielectric loss tangent	1kHz	-	0.038	
	1MHz	-	0.032	

5. Durability

5.1 Thermal resistance

Iron test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C, and the adhesive was cured for 24 hours in the same environment. Then, the test pieces were aged at various temperatures for the predetermined time, and the lap shear strength was measured after they were cooled to room temperature. (3TS-4100-011)

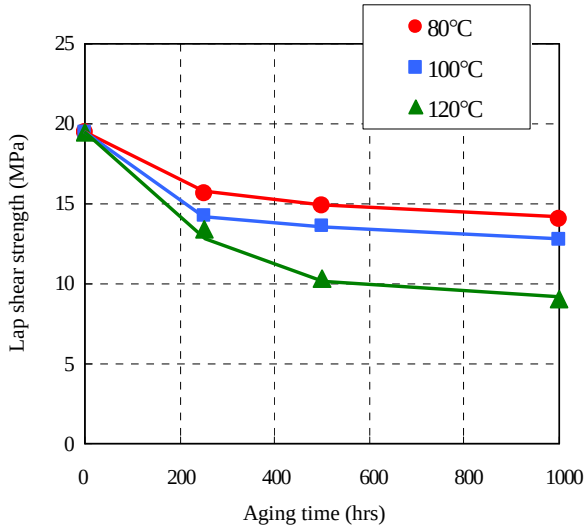

Fig.1 Heat resistance of TB3177

5.2 Thermal resistance during heating

After iron test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C and the adhesive was cured for 24 hours in the same environment, they were exposed to each temperature for 2 hours, and the lap shear strength was measured at the temperature. (3TS-4100-011)

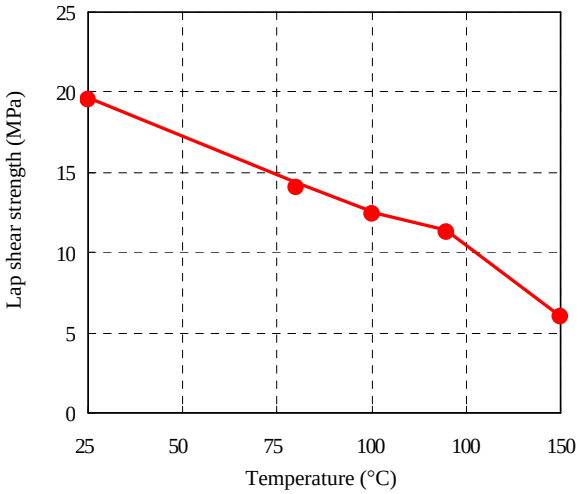

Fig.2 Heat resistance of TB3177 during heating

5.3 Thermal resistance (strength during heating after aging)

After iron test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C and the adhesive was cured for 24 hours in the same environment, they were exposed to 120°C for the predetermined time, and the lap shear strength was measured at 120°C. (3TS-4100-011)

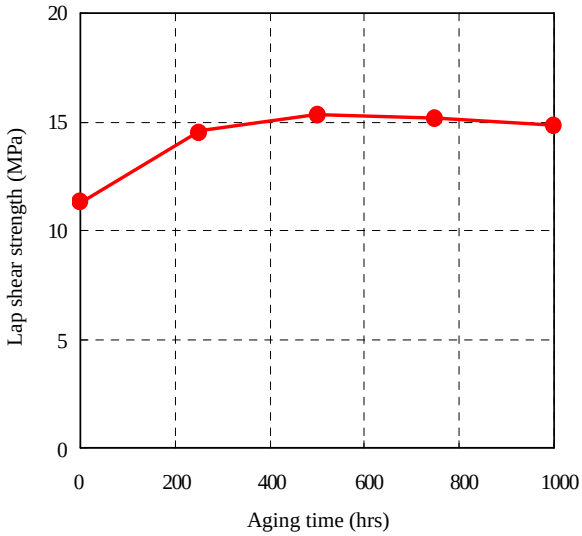

Fig.3 Heat resistance of TB3177 (strength under heat after aging)

5.4 Heat cycle resistance

Iron test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C, and the adhesive was cured for 24 hours in the same environment. Then, the test pieces were exposed to the specified number of heat cycles (one cycle: at -40°C for 30 min and at 120°C for 30 min). After they were cooled to room temperature, the lap shear strength was measured.
(3TS-4100-011)

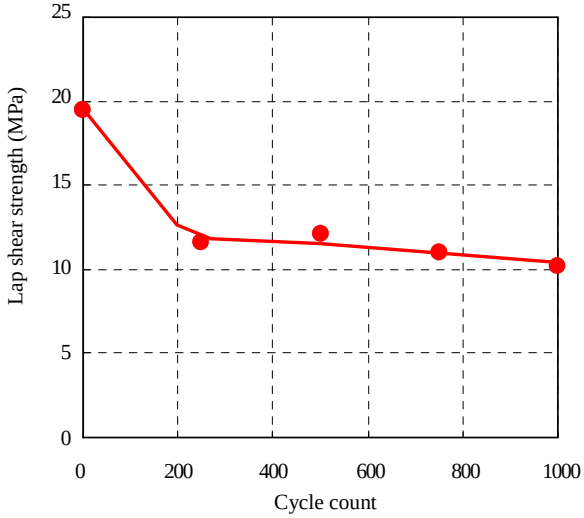

Fig.4 Heat cycle resistance of TB3177

5.5 Moisture resistance

Aluminum test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C, and the adhesive was cured for 24 hours in the same environment. Then, after aging at various temperatures and amount of moistures for the predetermined time, they were cooled to room temperature, and the lap shear strength was measured. (3TS-4100-011)

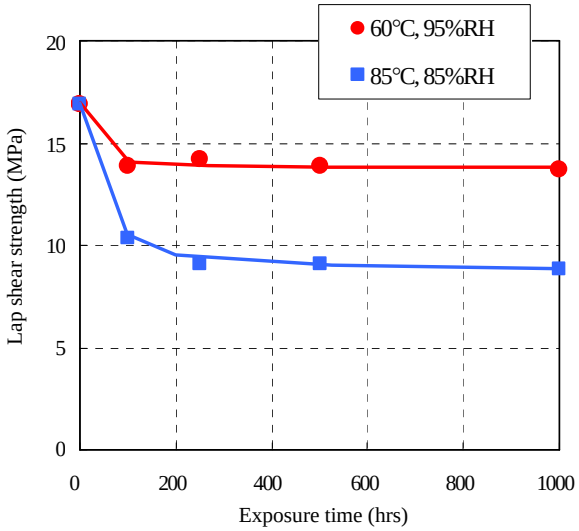

Fig.5 Moisture resistance of TB3177

5.6 Water resistance

Aluminum test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C, and the adhesive was cured for 24 hours in the same environment. Then, the test pieces were immersed in water at various temperatures for the spe After a lapse of the predetermined time, they were taken from water and dried, and the lap shear strength was measured. (3TS-4100-011)

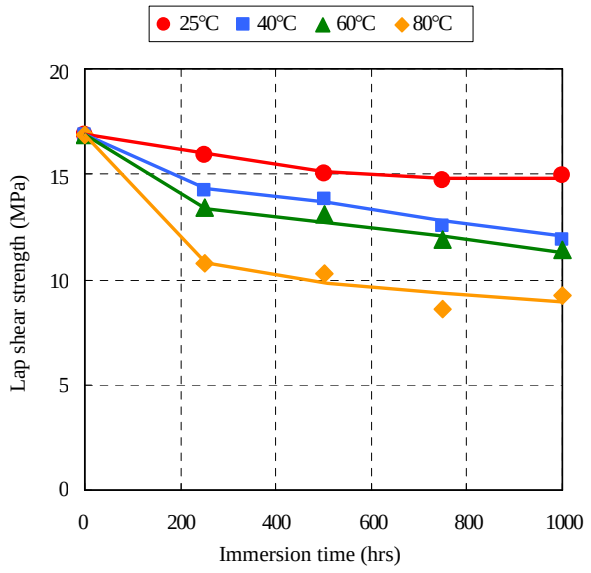

Fig.6 Water resistance of TB3177

5.7 Chemical resistance

Iron sheet test pieces were bonded with the adhesive in an environment with a relative humidity of 50% at 25°C, and the adhesive was cured for 24 hours in the same environment. Then, they were immersed in various chemicals for 250 hours under the following After they were taken from the chemicals and dried, the lap shear strength was measured at room temperature. (3TS-4100-011)

Table 5 Chemical resistance of TB3177

Chemical	Immersion temperature	Lap shear strength (MPa)
		TB3177
Before immersion	-	19.5
Isopropyl alcohol	25°C	21.8
Toluene	25°C	19.0
Gasoline	25°C	18.1
Engine oil	40°C	20.0
Long-life coolant (50%aq.)	25°C	20.8

6. Usage

(1) Completely remove moisture, oil, rust and other contaminants from the surface to be bonded and the fitting area.
(2) Apply the adhesive to the surface to be bonded and the fitting area.
The thinner the adhesive layer, the higher the adhesion.
(3) Rub the surfaces to spread the adhesive liquid thin and uniformly, and fix them in the specified position.
(4) The bonding time slightly differs depending on the kind of substrate or surface condition. In the case of moisture curing, the adhesive interlocks after several seconds to 3 minutes and develops practical strength after 30 minutes to 2 hours.
(5) In the case of light curing, cure the adhesive using an irradiator after bonding. Cure the overflow in the same manner. The adhesion can be immediately increased to the practical strength.

7. Storage

Since the adhesive is a chemical product, its quality will be deteriorated if it is stored at a high temperature or humidity or under the influence of UV light. Store it with the cap tightly fitted in a dry and dark space at 5 to 10° C (in a refrigerator) avoiding direct sunlight.

8. Disposal

After the adhesive has all been used, ask a licensed waste disposal company to dispose of the container as industrial waste.

9. Directions for use

- When using it, wear appropriate protective clothing, such as a mask, gloves (impervious) and goggles. Use it in a well-ventilated outdoor area or in a place equipped with a local exhaust system.
- Harmful to health. Do not inhale or ingest.
- If swallowed, induce vomiting, and immediately get medical attention.
- It may irritate the eyes, skin and respiratory organs. Handle it carefully.

- If it gets in the eyes, wash them with clean water for about 15 minutes, and get medical attention. While washing the eyes, take care not to blink too frequently or rub the eyes. Never use a remover or a solvent, as doing so may damage the eyeballs.
- It strongly and quickly bonds the skin and mucous membranes. Handle it carefully.
- If it adheres to the skin, wipe it away with a cloth, and wash the skin with soap.
- If fingers are bonded with it and cannot be separated, do not separate the fingers forcibly. Separate them by rubbing them in warm water at 40°C or so.
- If any bodily abnormality occurs, discontinue use, and get medical attention.
- Do not use on human body.
- Keep out of reach of children.
- Combustible. Keep away from fire.
- The product may spout from the nozzle. Do not point nozzle towards people.
- Persons with allergies or sensitive skin should avoid using it.
- If it adheres to clothing, it will generate heat, thereby causing scald. Handle it carefully.
- Some materials may be deformed by the heat of chemical reaction.
- Some substrates may deteriorate if this product is used.
- Before using, sufficiently confirm whether the method of application and the purpose are appropriate.
- The curing speed varies depending on the type of light source and irradiation distance. Check the curing speed prior to use.
- It may generate a large amount of heat and foams depending on the curing conditions. Sufficiently check the conditions prior to use.
- Do not put it near alkaline substances, such as epoxy resin cure agents.
- If some adhesive overflows, the exposed portion may whiten due to adhesive vapor solidification.
- Use it in a well-ventilated place.
- It cures slowly under the influence of interior lamps or sunlight.
  Bond the substrates immediately after applying.
- To prevent condensation, unseal the container after it reaches room temperature.
- It does not adhere to polyethylene, polypropylene, fluoroplastics, silicone resin, soft vinyl chloride or glass. Use the special primer.
- For other hazard and toxicity information, see the safety data sheet (SDS).

10. Precautions

For Industrial Use Only (Do not use for household purposes.)

This product is developed for general industrial use. Before using this product, the user must accept the following terms:

- The technical data given herein are not guaranteed values, but examples of experimental values obtained by our specified test methods.
  We do not guarantee that the uses described herein do not conflict with any intellectual property right.
- Before using this product, confirm the appropriateness and safety of the use for the application in question, and bear all responsibilities and risks involved in the use. Never embed or inject into bodies nor use as a medical implant that may be left in the body.
- We are not liable for personal injury or property damage caused by improper handling of this product.
  If the properties or usage of the product to be used are unclear, never use it.
- For detailed safety information of the product, see the Safety Data Sheets (SDS).
  To obtain the SDS, contact our sales office or customer service center.
- Information in this document is subject to change at our own discretion.

11. Registered trademark