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Technical Data Sheet

Product 4304

Industrial Version, April 2001

PRODUCT DESCRIPTION

LOCTITE® Product 4304 is a low viscosity, one-part, UV curing cyanoacrylate adhesive. The product is specifically formulated for an extremely rapid UV or visible light cure with a cyanoacrylate secondary cure mechanism.

TYPICAL APPLICATIONS

Loctite Product 4304 is designed for bonding applications that require very rapid fixturing, fillet cure or surface cure. The products UV cure mechanism offers an alternative to solvent borne accelerators (for accelerating cure and minimizing blooming) without the expense or environmental concerns. Since the product cures via an anionic polymerization, it is not inhibited by oxygen. This results in an extremely rapid surface cure which makes this adhesive well suited for coatings. Loctite Product 4304 complies with the Loctite ISO-10993 Biocompatibility test program. Certificates of Compliance are available through the Loctite Quality Department. Suitable for use in assembly of disposable medical devices.

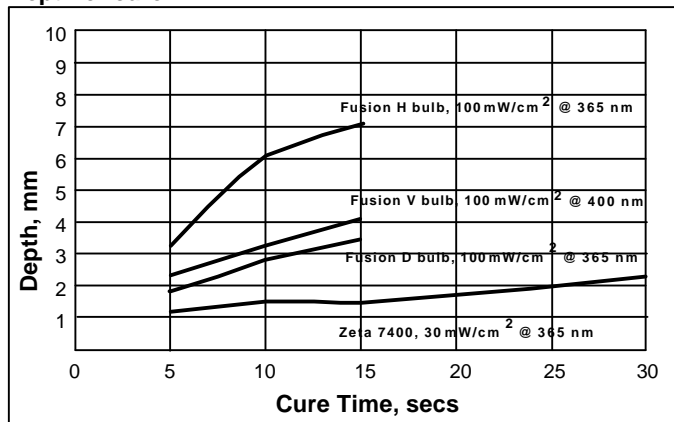
PROPERTIES OF UNCURED MATERIAL

	Typical Value	Range
Chemical Type	Photoinitiated ethyl cyanoacrylate	
Appearance	Light amber to a faint green	
Specific Gravity @ 25°C	1.07	
Viscosity @ 25°C, mPa.s (cP)	20	15 to 30
Flash Point (TCC), °C (°F)	83(182)	

TYPICAL CURING PERFORMANCE

Primary Cure Mechanism, UV

Depth of cure



Tack Free Time

Single drop on glass slide.

Bulb Type	Intensity	Tack Free Time (sec)
Fusion V bulb	100 mW/cm ² @ 400 nm	≤ 5
Fusion H bulb	100 mW/cm ² @ 365 nm	≤ 5
Fusion D bulb	100 mW/cm ² @ 365 nm	≤ 5
Zeta 7400 bulb	30 mW/cm ² @ 365 nm	≤ 5

Effect of substrate transparency and light source

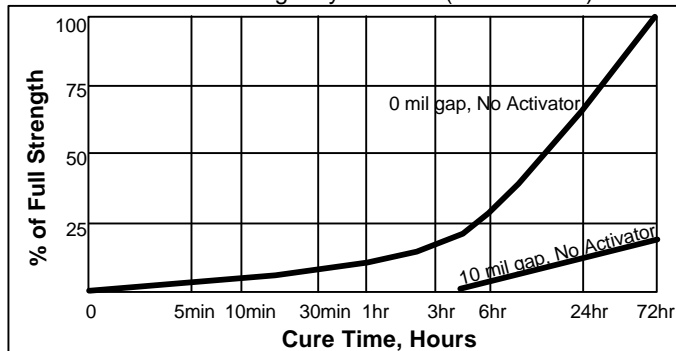
Block shear strength, ASTM D-450, 0 mil gap.
Zeta 7400, 30 mW/cm² @ 365 nm for 10 seconds.
Fusion V bulb, 100 mW/cm² @ 400 nm for 10 seconds.

Material	UV Cure	Post UV cure	Strength	
			psi	(N/mm ²)
UV blocking polycarbonate	Zeta 7400	2 min @ RT	1,740	(12.0)
	Zeta 7400	24 hr @ RT	2,530	(17.4)
	Fusion V bulb	2 min @ RT	2,370	(16.3)
	Fusion V bulb	24 hr @ RT	2,250	(15.5)
UV transmitting polycarbonate	Zeta 7400	2 min @ RT	2,100	(14.4)
	Zeta 7400	24 hr @ RT	2,650	(18.2)
	Fusion V bulb	2 min @ RT	2,380	(16.4)
	Fusion V bulb	24 hr @ RT	2,510	(17.3)

Secondary Cure Mechanism, Cyanoacrylate

Cure speed vs. gap & activator

Substrate: UV transmitting acrylic blocks (non UV cure).



Fixture speed vs. substrate

The rate of cure will depend on the substrate used. The table below shows the fixture time achieved on different materials at 22°C, 50% relative humidity. This is defined as the time to develop a shear strength of 0.1 N/mm² (14.5 psi) tested according to ASTM D1002.

Substrate	Fixture Time, seconds
ABS	≥ 5 ≤ 10
Acrylic	≥ 10 ≤ 20
Aluminum (etched)	≤ 5
Neoprene	≤ 5
Phenolic	≥ 60 ≤ 75
Polycarbonate	≥ 10 ≤ 20
Polyethylene	≥ 300
Polyethylene (Primer 770)	≤ 5
Polypropylene	≥ 300
Polypropylene (Primer 770)	≤ 5
PVC	>70 ≤ 85
Steel (grit blasted)	≥ 30 ≤ 45

TYPICAL PROPERTIES OF CURED MATERIAL

Physical Properties

Cured with Fusion V, 100mW/cm² @ 400 nm, 10 seconds per side and 24 hour room temperature cure.

Property	Typical Value
Tensile Strength @ Break, ASTM D-882, psi (N/mm ²)	5,200 (35.8)
Elongation @ Break, ASTM D-882, %	8.7
Modulus, ASTM D-882, psi (N/mm ²)	237,000 (1,630)
Hardness, ASTM D2240, Shore D-2	72
Shrinkage, ASTM D-792, %	12.8
CTE ASTM D696, ppm/°C	73.9 x 10 ⁶
Tg, ASTM E228, °C	106

Electrical Properties

Cured sheets (~.025" thick) with Fusion V bulb, 100 mW/cm² at 365nm, 10 seconds per side and 24 hour room temperature cure.

	Constant	Loss
Dielectric constant & loss, 25°C, ASTM D150		
measured at :		
100 Hz	4.01	0.039
1 kHz	3.73	0.041
10 kHz	3.55	0.037
Volume Resistivity, ASTM D257, Ω.cm	6.43 x 10 ¹⁵	
Surface Resistivity, ASTM D257, Ω	1.70 x 10 ¹⁵	
Dielectric strength, ASTM D149, V/mil	840	

PERFORMANCE OF CURED MATERIAL

Block Shear Strength, ASTM D-4501

72 hour room temperature cure (non-UV)

	Typical Value
ABS	4,990 (34.4)
Acrylic	1,920 (13.3)
Aluminum (etched)	2,550 (17.6)
Neoprene	110 (0.7)
Phenolic	1,040 (7.2)
Polycarbonate	4,160 (28.7)
Polyethylene	60 (0.4)
Polypropylene	60 (0.4)
PVC	4,800 (33.1)
Steel (grit blasted)	2,590 (17.8)

TYPICAL ENVIRONMENTAL RESISTANCE

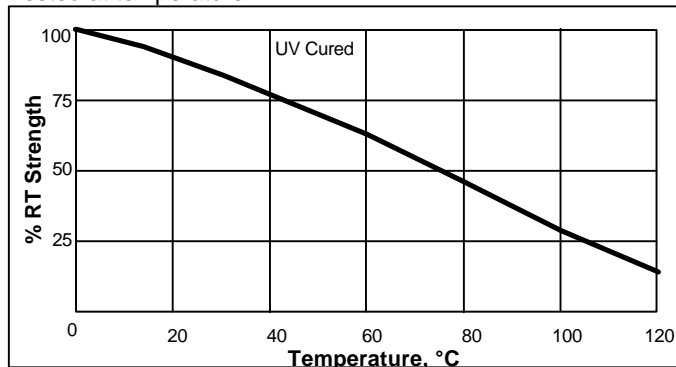
Test Procedure : ASTM D-4501

Substrate: Polycarbonate

Cure procedure: Zeta 7400, 30 mW/cm² @ 365 nm for 10 seconds and 24 hour room temperature cure.

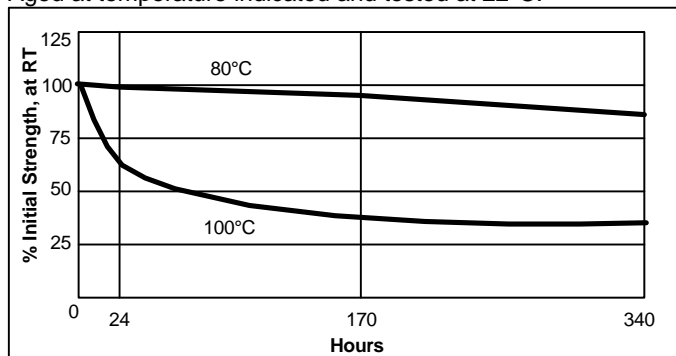
Hot Strength

Tested at temperature.



Heat Aging

Aged at temperature indicated and tested at 22°C.



Chemical / Solvent Resistance

Aged under conditions indicated and tested at 22°C.

Solvent	Temp.	% Initial strength retained at		
		24 hrs	170 hrs	500 hrs
Motor Oil	22°C	110	105	110
Water	22°C	105	110	110
Isopropanol	22°C	115	110	120
Humidity 100% RH	40°C	115	130	160

Effects of Sterilization

In general, products similar in composition to Loctite Product 4304 subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kilorays cumulative) show excellent bond strength retention. Product 4304 maintains bond strength after 1 cycle of steam autoclave. It is recommended that customers test specific parts after subjecting them to the preferred sterilization method. Consult with Loctite for a product recommendation if your device will see more than 3 sterilization cycles.

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Material Safety Data Sheet, (MSDS).

Approvals

Product 4304 has been granted ISO-10993 certification which makes it particularly suited for use in medical devices.

Storage

Product shall be ideally stored in a cool, dry location in unopened containers at a temperature between 8°C to 21°C (46°F to 70°F) unless otherwise labeled. Optimal storage conditions for unopened containers of cyanoacrylate products are achieved with refrigeration: 2°C to 8°C (36°F to 46°F). Refrigerated packages shall be allowed to return to room temperature prior to opening and use. To prevent contamination of unused product, do not return any material to its original container. For specific shelf life information contact your local Technical Service Center.

Data Ranges

The data contained herein may be reported as a typical value and/or range. Values are based on actual test data and are verified on a periodic basis.

Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.