LOCTITE® 3491™

November 2004

PRODUCT DESCRIPTION

LOCTITE® 3491™ provides the following product characteristics:

Technology	Acrylic
Chemical Type	Modified acrylate
Appearance (uncured)	Transparent liquid[LMS]
Components	One component - requires no mixing
Viscosity	Medium
Cure	Ultraviolet (UV) light
Cure Benefit	Production - high speed curing
Application	Bonding, Potting or Sealing

LOCTITE® 3491™ cures in seconds upon exposure to ultraviolet radiation of 365nm to form an impact resistant bond which exhibits excellent resistance to prolonged humidity or water immersion. Typical applications include bonding and sealing or potting applications of glass to itself or other materials, such as rough surface decorative glass, molded glass tableware items or automotive lighting components.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.03
Refractive Index	1.48
Flash Point - See MSDS	
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):	
Spindle 2, speed 20 rpm	750 to 1,500[LMS]

TYPICAL CURING PERFORMANCE

Cure can be effected with both low and high intensity ultraviolet light sources. A low UV intensity of 30 mW/cm² will cure highly transmitting substrates with <.25mm gap in 5 seconds or 1.77 to 2.28mm gaps in 10 to 20 seconds. A high UV intensity of 100 mW/cm² will cure highly transmitting substrates with .25mm gap in 2 seconds or 2.54 to 5.08mm gaps in 10 to 20 seconds. The table below represents typical fixture times for glass substrates with no induced gap. Full cure is estimated to be 6X the fixture time upon continued exposure to UV radiation.

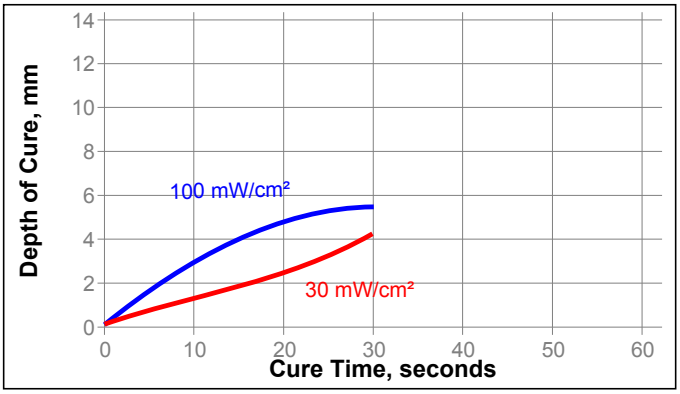
Fixture Time

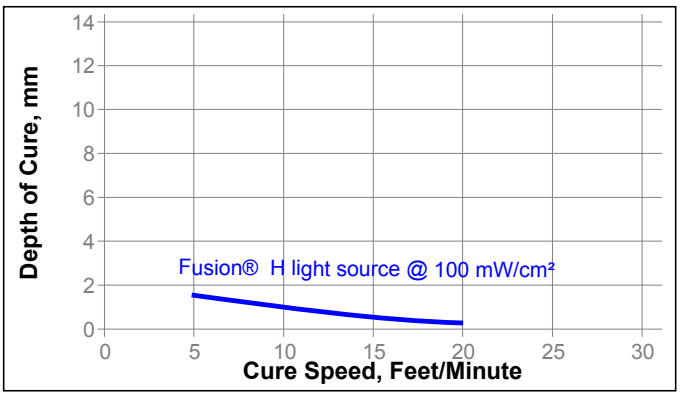
Fixture time is defined as the time to develop a shear strength of 0.1 N/mm² .

UV Fixture Time, ISO 4587, Glass microscope slides, seconds:	
6 mW/cm² @ 365 nm	5 to 20
30 mW/cm² @ 365 nm	4
100 mW/cm² @ 365 nm	1

Depth of Cure

The following graphs show the effect of light source, light intensity and exposure time on depth of cure for LOCTITE® 3491™





TYPICAL PROPERTIES OF CURED MATERIAL

Physical Properties

Shore Hardness, ISO 868, Durometer D		75
Elongation, at yield, ISO 527, %		4
Elongation, at break, ISO 527, %		27
Tensile Strength, at yield, ISO 527	N/mm²	44.1
	(psi)	(6,400)
Tensile Strength, at break, ISO 527	N/mm²	25.5
	(psi)	(3,700)
Tensile Modulus, ISO 527	N/mm²	1,986
	(psi)	(288,000)

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Lap Shear Strength, ISO 4587:		
Glass to Glass:		
0 gap	N/mm²	4.1
	(psi)	(600)
0.5 mm gap	N/mm²	4.1
	(psi)	(600)

Block Shear Strength, ISO 13445:

Steel to Glass	N/mm²	10
	(psi)	(1,450)
Aluminum to Glass	N/mm²	4.1
	(psi)	(600)
Stainless steel to Glass	N/mm²	2.6
	(psi)	(370)
G-10 Epoxyglass to Glass	N/mm²	6
	(psi)	(870)
PVC to Glass	N/mm²	2.8
	(psi)	(410)
ABS to Glass	N/mm²	1
	(psi)	(145)
Polycarbonate to Glass	N/mm²	1.2
	(psi)	(180)
Acrylic to Glass	N/mm²	1
	(psi)	(145)

135° Peel Strength:

Glass	N/mm	6.8
	(lb/in)	(39)

Cured @ 6 mW/cm² @ 365 nm for 30 seconds

Torsional Shear Strength, ASTM D 3658:

Aluminum hex button to Glass	N·m	≥61[LMS]
	(lb·ft)	(≥45)

TYPICAL ENVIRONMENTAL RESISTANCE

Heat Aging

Aged at temperature indicated and tested @ 22 °C

Lap Shear Strength, ISO 4587, % of initial strength:

Glass to Glass:

0 gap:

Aged @ 121°C for 500 hours	100
Aged @ 121°C for 1,000 hours	100
Aged @ 149°C for 500 hours	100
Aged @ 149°C for 1,000 hours	100

0.5 mm gap:

Aged @ 121°C for 500 hours	95
Aged @ 121°C for 1,000 hours	95
Aged @ 149°C for 500 hours	100
Aged @ 149°C for 1,000 hours	100

Torsional Shear Strength, ASTM D 3658, % of initial strength:

Aluminum hex button to Glass:

Aged @ 121°C for 500 hours	100
Aged @ 121°C for 1,000 hours	100
Aged @ 149°C for 500 hours	95
Aged @ 149°C for 1,000 hours	55

Humidity Resistance

Aged @ 49°C / condensing humidity and tested @ 22 °C

Torsional Shear Strength, ASTM D 3658, % of initial strength:

Aluminum hex button to Glass:

Aged 2 weeks	100
Aged 4 weeks	100

Lap Shear Strength, ISO 4587, % of initial strength:

Glass to Glass:

Aged 2 weeks:

0 gap	100
0.5 mm gap	100

Aged 4 weeks:

0 gap	100
0.5 mm gap	100

Block Shear Strength, ISO 13445, % of initial strength:

Aluminum to Glass:	
Aged 2 weeks	100
Aged 4 weeks	100
Stainless steel to Glass:	
Aged 2 weeks	100
Aged 4 weeks	100
G-10 Epoxyglass to Glass:	
Aged 2 weeks	100
Aged 4 weeks	100
PVC to Glass:	
Aged 2 weeks	70
Aged 4 weeks	60
ABS to Glass:	
Aged 2 weeks	100
Aged 4 weeks	70
Polycarbonate to Glass:	
Aged 2 weeks	100
Aged 4 weeks	90
Acrylic to Glass:	
Aged 2 weeks	95
Aged 4 weeks	75

Dishwasher Cycle Resistance

Aged at continuous dishwasher cycling and tested at 22°C

Torsional Shear Strength, ASTM D 3658, % of initial strength:

Aluminum hex button to Glass:

Aged 25 Cycles	100

Lap Shear Strength, ISO 4587, % of initial strength:

Glass to Glass:

Aged 25 Cycles:

0 gap	100
0.5 mm gap	90

Block Shear Strength, ISO 13445, % of initial strength:

Aluminum to Glass:	
Aged 25 Cycles	100
Stainless steel to Glass:	
Aged 25 Cycles	100
G-10 Epoxyglass to Glass:	
Aged 25 Cycles	100
PVC to Glass:	
Aged 25 Cycles	50
ABS to Glass:	
Aged 25 Cycles	65
Polycarbonate to Glass:	
Aged 25 Cycles	60
Acrylic to Glass:	
Aged 25 Cycles	90

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).

Directions for use

1. This product is light sensitive; exposure to daylight, UV light and artificial lighting should be kept to a minimum during storage and handling.
2. The product should be dispensed from applicators with black feedlines.
3. For best performance bond surfaces should be clean and free from grease.
4. Cure rate is dependent on lamp intensity, distance from light source, depth of cure needed or bondline gap and light transmittance of the substrate through which the radiation must pass.
5. Recommended intensity for cure in an adhesive application (between substrates) is 40 mW/cm² minimum (measured at the bondline) with an exposure time of 5-6 times the fixture time at this same intensity.
6. For tack free surface cure, as necessary in coating, potting or tacking applications, higher intensity UV is required (100mW/cm² minimum).
7. Cooling should be provided for temperature sensitive substrates such as thermoplastics.
8. Plastic grades should be checked for risk of stress cracking when exposed to liquid adhesive.
9. Excess uncured adhesive can be wiped away with organic solvent (e.g. Acetone).
10. Bonds should be allowed to cool before subjecting to any service loads.

Loctite Material Specification[LMS]

LMS dated February 7, 1996. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

Storage

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions

(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

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, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel 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 Henkel 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.

Trademark usage

Reference 1