LOCTITE® 4205™

March 2010

PRODUCT DESCRIPTION

LOCTITE® 4205™ provides the following product characteristics:

Technology	Cyanoacrylate
Chemical Type	Ethyl cyanoacrylate
Appearance (uncured)	Colorless to slightly pale yellow liquid LMS
Components	One part - requires no mixing
Viscosity	Gel
Cure	Humidity
Application	Bonding
Key Substrates	Rubbers, Plastics and Metals

LOCTITE® 4205™ is a general purpose adhesive suitable for applications where heat resistance is required. LOCTITE® 4205™ is toughened with elastomers for flexibility, impact resistance and improved resistance to heat and humidity.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C — 1.1

Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):
Spindle TC, speed 20 rpm — 10,000 to 60,000 LMS

Viscosity, Cone & Plate, 25 °C, mPa·s (cP):
Physica MC100, Cone MK 22, shear rate 100 s^{-1} — 400 to 1,600 LMS

Flash Point - See MSDS

TYPICAL CURING PERFORMANCE

Under normal conditions, the atmospheric moisture initiates the curing process. Although full functional strength is developed in a relatively short time, curing continues for at least 24 hours before full chemical/solvent resistance is developed.

Cure 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 .

Fixture Time, seconds:

Steel (degreased)	50 to 65
Aluminum	10 to 30
ABS	10 to 20
SBR (smooth)	150 to 180
NBR	10 to 20
EPDM	120 to 180
Phenolic	80 to 105
Zinc dichromate	90 to 120
Neoprene	30 to 45
PVC	210 to 240
Polycarbonate	50 to 75
G-10 Epoxy	15 to 30
Wood (pine)	180 to 210
Rubber, nitrile	10 to 20

Cure Speed vs. Bond Gap

The rate of cure will depend on the bondline gap. Thin bond lines result in high cure speeds, increasing the bond gap will decrease the rate of cure.

Cure Speed vs. Activator

Where cure speed is unacceptably long due to large gaps, applying activator to the surface will improve cure speed. However, this can reduce ultimate strength of the bond and therefore testing is recommended to confirm effect.

TYPICAL PROPERTIES OF CURED MATERIAL

After 72 hours @ 22 °C, followed by 24 hours @ 50 °C, followed by 2 hours @ 82 °C

Physical Properties:

Glass Transition Temperature (Tg), °C	105
Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}	77×10^{-6}

Electrical Properties:

Volume Resistivity, IEC 60093, Ω·cm	2.0×10^{15}
Surface Resistivity, IEC 60093, Ω	$\geq1.3\times10^{17}$
Dielectric Breakdown Strength, IEC 60243-1, kV/mm	32
Dielectric Constant / Dissipation Factor, IEC 60250:	
1 kHz	3.22 / <0.03
100 kHz	3.09 / <0.03
1 mHz	2.86 / <0.03

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 24 hours @ 22 °C

Lap Shear Strength, ISO 4587:		
Steel (grit blasted)	N/mm²	18.7 to 23.2
	(psi)	(2,710 to 3,360)
Aluminum	N/mm²	14.5
	(psi)	(2,100)
SBR	N/mm²	0.7 to 0.8
	(psi)	(100 to 120)
Nitrile	N/mm²	0.6 to 0.7
	(psi)	(90 to 100)
Phenolic	N/mm²	8.6 to 9.5
	(psi)	(1,250 to 1,380)
Neoprene	N/mm²	0.6 to 0.7
	(psi)	(90 to 100)
Block Shear Strength, ISO 13445:		
ABS	N/mm²	11.6 to 13
	(psi)	(1,680 to 1,885)
Phenolic	N/mm²	7.7 to 12.1
	(psi)	(1,120 to 1,750)
G-10 Epoxy	N/mm²	9.2 to 12
	(psi)	(1,330 to 1,740)

Cured for 24 hours @ 22 °C, followed by 24 hours @ 121 °C, tested @ 121 °C

Lap Shear Strength, ISO 4587:		
Steel (grit blasted)	N/mm²	≥5.6 LMS
	(psi)	(≥810)

Cured for 24 hours @ 22 °C, followed by 24 hours @ 121 °C, tested @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm²	≥18.6[LMS]
	(psi)	(≥2,700)

Cured for 48 hours @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm²	≥12.4[LMS]
	(psi)	(≥1,800)

180° Peel Strength, ISO 8510-2:

Steel (grit blasted)	N/mm	6
	(lb/in)	(35)

TYPICAL ENVIRONMENTAL RESISTANCE

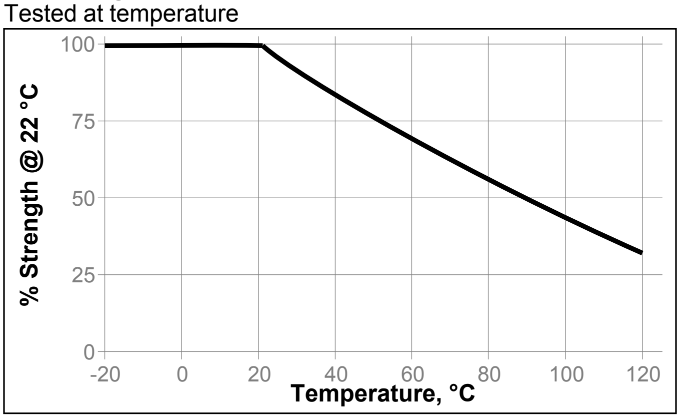
Cured for 72 hours @ 22 °C

Lap Shear Strength, ISO 4587:

Mild steel (grit blasted)

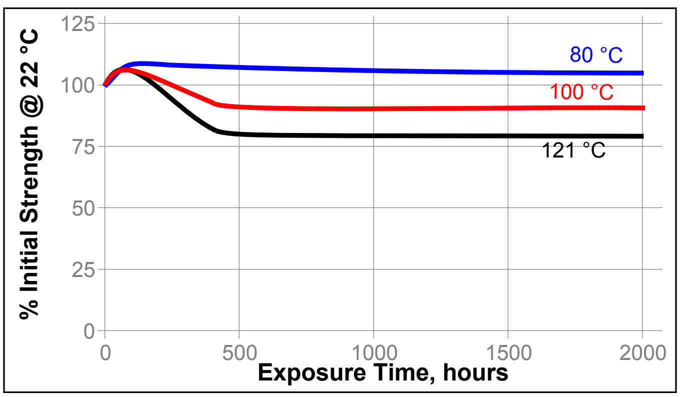
Hot Strength

Tested at temperature



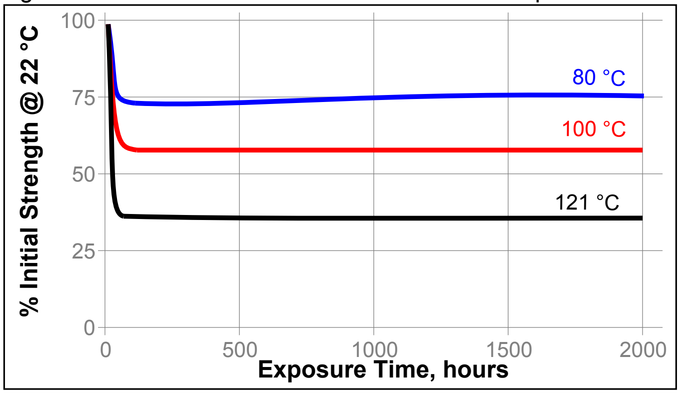
Heat Aging

Aged at temperature indicated and tested @ 22 °C



Heat Aging/Hot Strength

Aged under conditions indicated and tested at temperature



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C

		% of initial strength		
Environment	**°C**	**100 h**	**500 h**	**100 h**
Motor oil	40	110	115	120
Gasoline	22	105	100	90
Ethanol	22	110	100	100
Isopropanol	22	100	105	100
Heat/humidity 95% RH	40	105	105	110

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. For best performance bond surfaces should be clean and free from grease.
2. This product performs best in thin bond gaps (0.05 mm).
3. Excess adhesive can be dissolved with Loctite cleanup solvents, nitromethane or acetone.

Loctite Material Specification[LMS]

LMS dated November 30, 2009. 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: 2 °C to 8 °C. Storage below 2 °C or greater than 8 °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
µm / 25.4 = mil
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 1.2