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Advanced Materials

Araldite® 2011-A/B

MULTI-PURPOSE EPOXY ADHESIVE

DESCRIPTION :

Araldite® 2011-A/B epoxy adhesive is a multi-purpose, viscous material that is suitable for bonding a variety of materials, including metal, ceramic, and wood. The electrically insulating adhesive is easy to apply either manually by spatula and stiff brush or mechanically with meter/mix and coating equipment. Araldite® 2011-A/B epoxy adhesive cures at temperatures from 68ºF (20ºC) to 356ºF (180ºC) with no release of volatile constituents. It qualifies to ABR 2-1079 and DAN 1284-01.

APPLICATIONS :

- Metal
- Ceramics
- Wood
- Vulcanized Rubber
- Foams
- Plastics

ADVANTAGES :

- Long open time
- High shear and peel strength
- Easy to apply
- Good resistance to static and dynamic loads
- Electrically insulating

TYPICAL PROPERTIES :

		Test Values[1]	
Property	**Test Method**	**Resin**	**Hardener**
Color/appearance	Visual	Creamy, viscous/liquid	Amber Liquid
Specific Gravity	ASTM D-792	1.17	0.92
Viscosity (cP) @ 77°F (25°C)	ASTM D-2393	50,000	35,000

TYPICAL MIXED PROPERTIES :

Property	**Test Method**	**Test Values[1]**
Reaction Ratio (by weight)		100R/80H
Reaction Ratio (by volume)		100R/100H
Pot Life, hours @ 77°F (25°C) (4.fl. oz. mass)	ASTM D-2471	2
Mixed viscosity (cP) @ 77°F (25°C)	ASTM D-2393	45,000

[1]Tested @ 77°F (25°C)

RECOMMENDED CURE SCHEDULES:

Temperature	Handling Strength	Minimum Cure Time
68ºF (20ºC)	12 hours	15 hours
77ºF (25ºC)	7 hours	12 hours
104ºF (40ºC)	2 hours	3 hours
158ºF (70ºC)	30 minutes	50 minutes
212ºF (100ºC)	6 minutes	10 minutes
302ºF (150ºC)	4 minutes	5 minutes

TYPICAL CURED PROPERTIES :

Application of Adhesive

The resin/hardener mix is applied with a spatula to the pretreated and dry joint surfaces.

A layer of adhesive 0.002 to 0.004-inches (0.05 to 0.10-mm) thick will normally impart the greatest lap shear strength to a joint.

The joint components should be assembled and clamped as soon as the adhesive has been applied. Even contact throughout suffices to ensure proper cure.

Standard Test Specimens

Unless otherwise stated, the figures given below were all determined by testing standard specimens made up by lap-jointing 4-inch x 1-inch x 0.06-inch (10-cm x 2.5-cm x 1.5-mm) strips of aluminum. The joint area was 0.5 x 1 inch (12.5 mm x 2.5 cm) in each case.

Property	Test Method	Test Values[1]
Lap Shear Strength, psi (MPa)	ASTM D-1002	
Effects of cure time and temperature		
Cure Temperature	**Time**	
77ºF (25ºC)	8 hours	710 (4.9)
	15 hours	1990 (13.7)
	24 hours	2130 (14.7)
	72 hours	2280 (15.7)
	5 days	2560 (17.6)
158ºF (70ºC)	1 hour	3130 (21.5)
	2 hours	3410 (23.5)
	3 hours	3200 (22)
212ºF (100ºC)	10 minutes	3700 (25.5)
	20 minutes	3980 (27.4)
	30 minutes	4120 (28.4)
302ºF (150ºC)	5 minutes	4270 (29.4)
	10 minutes	4410 (30.4)
	20 minutes	4410 (30.4)

Property	**Test Method**
Lap Shear Strength, psi (MPa)	ASTM D-1002

Effect of Test Temperature

(Load applied 10 minutes after specimens reach test temperature.)

Cure Cycle	**Test Temp.**	
5 days @ 77ºF (25ºC)	-76ºF (-60ºC)	2840 (19.5)
	-4ºF (-20ºC)	2840 (19.5)
	68ºF (20ºC)	2560 (17.6)
	104ºF (40ºC)	1420 (9.8)
	140ºF (60ºC)	570 (3.9)
20 min @ 212ºF (100ºC)	-76ºF (-60ºC)	3560 (24.5)
	-46ºF (-20ºC)	3410 (23.5)
	68ºF (20ºC)	3980 (27.4)
	104ºF (40ºC)	1990 (13.7)
	140ºF (60ºC)	1000 (6.9)

[1]Tested @ 77°F (25°C)

Property

Lap Shear Strength, psi (MPa)

Effect of Immersion

(Cure cycle 16 hours @ 104ºF (40ºC). Immersion for 90 days in media listed.)

Media	**Test Values[(1)]**
Standard - As prepared	2560 (17.6)
Acetone (30 days)	570 (3.9)
Acetylene	430 (2.9)
Gasoline	2410 (16.6)
Ethyl Acetate (30 days)	570 (3.9)
Acetic Acid 10%	Degraded
Methanol	Degraded
Lubricating Oil - HD30	2560 (17.6)
Kerosene	Degraded
Trichloroethylene	Degraded
Water @ 68°F (20°C)	1420 (9.8)
Water @ 194°F (90°C)	430 (2.9)

Lap Shear Strength, psi (MPa)

Effect of Tropical Exposure

(104º (40ºC)/92% R.H.)

Cure Cycle	**Exposure Time**	**Test Values [(1)]**
16 hrs @ 104ºF (40ºC)	0 days	2560 (17.6)
	10 days	2560 (17.6)
	30 days	1710 (11.8)
	60 days	1560 (10.7)
	90 days	570 (3.9)
20 min @ 212ºF (100ºC)	0 days	3980 (27.4)
	10 days	2560 (17.6)
	30 days	1710 (11.8)
	60 days	1560 (10.7)
	90 days	1280 (8.8)

[1]Tested @ 77°F (25°C)

Lap Shear Strength, psi (MPa) **Test Method**
Effect of Heat Aging ASTM D-1002
(Cured 16 hours @ 104ºF (40ºC).

Aging Temperature	Exposure Time	Test Values[(1)]
68ºF (20ºC)	0 days	2560 (17.6)
	1 years	2560 (17.6)
	2 years	2280 (15.7)
	3 years	1710 (11.8)
	4 years	1990 (13.7)
	5 year	1990 (13.7)
140ºF (60ºC)	3 days	2560 (17.6)
	10 days	2420 (16.6)
	30 days	2130 (14.7)
176ºF (80ºC)	3 days	2130 (14.7)
	10 days	2130 (14.7)
	30 days	2130 (14.7)
	60 days	2130 (14.7)
	1 year	1280 (8.8)
	2 years	710 (4.9)
	3 years	710 (4.9)
	4 years	430 (2.9)
	5 years	280 (1.9)
248ºF (120ºC)	3 days	2130 (14.7)
	10 days	2280 (15.7)
	30 days	2280 (15.7)
	60 days	2130 (14.7)

Property
Lap Shear Strength (psi)
Tested on Metal Substrates
(Cured 20 min @ 212ºF (100ºC)

Metal	Substrate Thickness (in./mm)	Test Values[(1)]
Carbon Steel	0.039/1.0	3840 (26.4)
Stainless Steel	0.039/1.0	3270 (22.5)
Galvanized Steel[2]	0.06/1.5	1990 (13.7)
Copper	0.06/ 1.5	3270 (22.5)
Brass	0.06/ 1.5	2990 (20.6)

[1]Tested @ 77°F (25°C)
[2]Surface degreased only, not roughened.

Property
Fatigue Strength (psi)
Tested using a load frequency of 90 Hz and a 1 inch (25 mm) joint overlap
(Cured 20 min @ 212ºF (100ºC)

Fatigue Limit Load % Static Shear Strength	Cycles to Failure[1]
50	10^3 -10^4
40	10^4 -10^5
30	10^5 -10^6
25	10^5 -10^6
20	10^6 -10^7
15	10^7

Property	Test Method	Test Values[1]
Ultimate Tensile Strength (psi)	ASTM D-638	4800 (33)
Elongation (%)	ASTM D-638	9
Tg per DMA, °F (°C)	ASTM D-4065	146 (63)
Hardness (Shore D)	ASTM D-2240	80
Coefficient of Thermal Expansion (in/in/°C)	ASTM E-831	8.5 X 10^{-5}
Roller Peel Test, pli (N/mm)	ISO 4578	28 (4.9)

[1]Tested @ 77°F (25°C)

STORAGE/ SHELF LIFE : Epoxy resins and hardeners should be stored in a dry place in their original, sealed containers at temperatures from 60-100°F (16-38°C). Material temperatures should be above 65°F (18°C) when mixing. After use, tightly reseal containers.

Under these conditions, epoxy resins and hardeners will remain useable for 12 months from date of shipping from Huntsman.

CAUTION :

Huntsman Advanced Materials Americas Inc. maintains up–to-date Material Safety Data Sheets (MSDS) on all of its products. These sheets contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Users should review the latest MSDS to determine possible health hazards and appropriate precautions to implement prior to using this material. Copies of the latest MSDS may be requested by calling our customer service group at 800-367-8793 or emailing your request to adhesives_group@huntsman.com.

FIRST AID !

Eyes and skin: Flush eyes with water for 15 minutes. Contact a physician if irritation persists. Wash skin thoroughly with soap and water. Remove and wash contaminated clothing before reuse.
Inhalation: Remove subject to fresh air.
Swallowing: Dilute by giving water to drink and contact a physician promptly. Never give anything to drink to an unconscious person.

KEEP OUT OF REACH OF CHILDREN

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