

Advanced Materials**Araldite[®] LY 5052-1 / Aradur[®] 5052-1****COLD-CURING EPOXY MATRIX SYSTEM**

APPLICATIONS	Aerospace and industrial composites	
GENERAL	<p>The cold-curing epoxy laminating system Araldite[®] LY 5052-1 / Aradur[®] 5052-1 meets the requirements of a large range of applications due to outstanding features.</p> <p>The viscosity of the components allows for easy mixing at room temperature and a complete impregnation of all current reinforcement fibers like glass, carbon and aramid. Due to its low viscosity build-up Araldite[®] LY 5052-1 / Aradur[®] 5052-1 is suitable for processing methods such as wet lay-up and RTM. Depending on the required properties the system can be cured either cold or warm.</p> <p>The resulting laminates exhibit excellent mechanical and dynamical properties.</p>	
CHEMICAL DESCRIPTION	<p>Araldite[®] LY 5052-1 is a modified epoxy resin. Aradur[®] 5052-1 is a formulated liquid amine hardener.</p>	
PROCESSING	<p>Filament Winding RTM Pressure Molding Wet Lay-up</p>	
ADVANTAGES	<p>Ease of mixing Complete impregnation of fibers Room or elevated temperature curing Excellent mechanical properties</p>	
TYPICAL PROPERTIES*	Araldite[®] LY 5052-1 Modified Epoxy Resin	
	Visual Appearance	clear liquid
	Color, Gardner, max	2
	Epoxy Value, eq./kg	6.6 - 6.8
	Epoxy Equivalent, g/eq.	146 - 150
	Viscosity @ 25°C (77°F), mPa s (cPs)	1000 - 1500
	Density @ 25°C (77°F), g/cm ³ (lb/gal.)	1.16 - 1.17 (9.7 - 9.8)
	Flash Point, Closed Cup, °C (°F)	>140 (>284)
	Aradur[®] 5052-1 Amine Hardener	
	Visual Appearance	clear liquid
	Color, Gardner, max	≤ 4
	Viscosity @ 25°C (77°F), mPa s (cPs)	40 - 60
	Density @ 25°C (77°F), g/cm ³ (lb/gal.)	0.93 - 0.95 (7.8 - 7.9)
	Flash Point, Closed Cup, °C (°F)	>93 (>200)
	* Typical properties are based on Huntsman's test methods. Copies are available upon request.	

MIX RATIOS

Recommended mix ratio of Araldite® LY 5052-1 / Aradur® 5052-1 is 100 / 38 parts by weight, 100 / 47 parts by volume.

We recommend that the components are weighed with an accurate balance to prevent mixing inaccuracies which can affect the properties of the matrix system. The components should be mixed thoroughly to ensure homogeneity. It is important that the side and the bottom of the vessel are incorporated into the mixing process.

Note: when processing large quantities of mixture the pot life will decrease due to exothermic reaction. It is advisable to divide large mixes into several smaller containers.

CURING**Typical Curing Schedules**

Gelation 8 – 16 hours @ 25°C + Post Cure 7 days @ 25°C

Gelation 4 – 8 hours @ 40°C + Post Cure 15 hours @ 50°C

Gelation 1 – 2 hours @ 60°C + 2 – 10 hours @ 80°C

PROCESSING**Initial Viscosity (cPs)**

@ 18°C	1150 – 1350
@ 25°C	600 – 700
@ 40°C	200 – 250

Viscosity Increase

Time	to 1500 cPs	to 3000 cPs
@ 25°C	50 – 60 min	90 – 110 min
@ 40°C	40 – 45 min	50 – 60 min
@ 60°C	15 – 18 min	18 – 22 min

Pot Life (Tecam)

@ 18°C	100 g	280 – 320 min
@ 25°C	100 g	220 – 260 min
@ 40°C	100 g	45 – 55 min

Gel Times (Hot Plate)

@ 25°C	420 – 500 min
@ 40°C	150 – 170 min
@ 60°C	45 – 55 min
@ 80°C	15 – 17 min
@ 100°C	5 – 6 min
@ 120°C	2 – 3 min

GLASS TRANSITION TEMPERATURE (DSC)	Cure:	Tg(°C)
	2 days 25°C	52 - 55
8 days 25°C	62 - 66	
4 months 23°C	67 - 61	
1 day 23 °C + 10 h 40 °C	70 - 76	
1 day 23 °C + 20 h 40 °C	74 - 80	
1 day 23 °C + 10 h 50 °C	80 - 85	
1 day 23 °C + 15 h 50 °C	82 - 88	
1 day 23 °C + 10 h 60 °C	94 - 104	
1 day 23 °C + 15 h 60 °C	96 - 106	
1 day 23 °C + 2 h 80 °C	108 - 114	
1 day 23 °C + 8 h 80 °C	114 - 122	
1 day 23 °C + 1 h 90 °C	108 - 118	
1 day 23 °C + 4 h 90 °C	116 - 126	
1 day 23 °C + 1 h 100 °C	118 - 130	
1 day 23 °C + 4 h 100 °C	120 - 134	
4 months 23 °C + 4 h 130 °C	120 - 132	

CURED PROPERTIES	Neat Resin Properties		
	Cure	7 d/RT	15 h/50°C
Tg (DSC)	64°C	85°C	118°C
Tensile Strength (kpsi)	8.7	12.2	12.3
Tensile Elongation (%)	2.0	3.4	5.8
Tensile Modulus (kpsi)	500	515	450
Flexural strength (kpsi)		18.4	17.4
Flexural Modulus (kpsi)		430	400
Flexural Elongation (%)		6.1	6.8
Fracture Toughness K _{IC} ($\sqrt{\text{in}\cdot\text{lb}/\text{in}^2}$)			730 ± 45
Fracture Energy G _{IC} ($\text{in}\cdot\text{lb}/\text{in}^2$)			1.15 ± 0.05

WATER ABSORPTION	Immersion:	Cure:	7 d/RT	8 h/80°C
	4days H ₂ O@ 23°C (%)			0.45-0.50
10days H ₂ O @ 23°C (%)			0.70-0.80	0.65-0.70
30min H ₂ O @ 100°C (%)			0.55-0.60	0.45-0.50
60min H ₂ O @ 100°C (%)			0.70-0.80	0.60-0.70

COEFFICIENT OF LINEAR THERMAL EXPANSION	Mean Value:	Cure:	7 d/RT	15 h/50°C	8 h/80°C
	α from 20-50 °C ($10^{-6}/\text{K}$)			97	-
α from 20-90 °C ($10^{-6}/\text{K}$)			-	71	-
α from 20-120 °C ($10^{-6}/\text{K}$)			-	-	71

POISSON'S RATIO	0.35
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LAMINATE PROPERTIES**Tensile / Flexural**Samples: 16 layers (4 mm) E-glass fabric 1:1, 280-300 g/m³

Fiber volume content: 45 - 46%

Cure: 10 hours / 80°C

Unconditioned

Flexural Strength (kpsi)	63.6 – 71.1
Flexural Modulus (kpsi)	2930 – 2990
Flexural Elongation (%)	2.7 – 3.0
Tensile Strength (kpsi)	52.2 – 56.6
Tensile Modulus (kpsi)	4800 – 5670
Tensile Elongation (%)	1.6 – 1.9

Conditioned 30 days in H₂O/23°C

Flexural Strength (kpsi)	55.1 – 58.0
Flexural Elongation (%)	2.4 – 2.7
Flexural Modulus (kpsi)	2855 – 2915

Interlaminar Shear Strength (ILSS)

Short Beam:

E-glass unidirectional specimen, thickness t=3.2 mm

Fiber volume content: 60%

Cure	<u>7 days / RT</u>	<u>8 hrs / 80°C</u>
Unconditioned		
Shear Strength (psi)	8265 - 8845	8700 - 9425
Conditioned 1 hr in H ₂ O @ 100°C		
Shear Strength (psi)	7975 - 8700	8400 - 9000

PACKAGING & STORAGE

Store at 40 - 104°F. Partially used containers should be immediately closed after use and stored in a dry environment.

**HANDLING/SAFETY
PRECAUTIONS**

Emergency Overview : Danger ! Corrosive - causes skin and eye burns. Harmful if swallowed, inhaled or absorbed through skin. Can cause allergic skin and respiratory reactions.

Precautions : Do not get on skin, in eyes, or on clothing. Do not inhale vapor, mist or spray. Use only with adequate ventilation. Keep container tightly closed when not in use and during transport. Individuals should wash thoroughly after handling. When poured, resin can generate static electricity sparks which can ignite flammable vapors or dusts.

**Read Material safety Data Sheet Before Using.
For Industrial Use Only.**

FIRST AID**In case of contact :**

Eyes : Promptly flush with large amounts of water. Get immediate medical attention.

Skin : Wash with mild soap and water. Get immediate medical attention.

Inhalation : Remove to fresh air. Give oxygen if breathing is difficult.

Ingestion : If swallowed, immediately give at least 3 - 4 glasses of water, but do not induce vomiting. If vomiting occurs, give fluids again. Do not give anything by mouth to an unconscious or convulsing person. Get immediate medical attention. Have a physician determine whether vomiting or stomach evacuation is necessary.

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Main Offices :

Huntsman Corporation
10003 Woodloch Forest Dr.
The Woodlands
Texas 77380
(281) 719-6000

**Huntsman Advanced Technology
Center**
8600 Gosling Rd.
The Woodlands
Texas 77381
(281) 719-7400