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Advanced Materials

Araldite® LY 564* / Aradur® 560*

COLD CURING EPOXY SYSTEM

Araldite® LY 564 is a low-viscosity epoxy resin
Aradur® 560 is based on polyamines

APPLICATIONS

Aerospace and industrial composites, aircraft repair, tooling.

PROPERTIES

Highly reactive laminating system with favourable properties after cure at lower temperatures. Asystem that has proven ist reliability in various cold-cure application.

PROCESSING

- Wet lay-up
- Pressure Moulding
- Resin Transfer Moulding (RTM)

KEY DATA

Araldite® LY 564		
Aspect (visual)	clear liquid	
Colour (Gardner, ISO 4630)	1 - 2	
Viscosity at 25 °C (ISO 12058-1)	1200 - 1400	[mPa s]
Density at 25 °C (ISO 1675)	1.1 - 1.2	[g/cm^3]
Flash point (ISO 2719)	185	[°C]
Storage temperature (see expiry date on original container)	2 - 40	[°C]

Aradur® 560		
Aspect (visual)	yellow liquid	
Viscosity at 25 °C (ISO 12058-1)	300 - 450	[mPa s]
Density at 25 °C (ISO 1675)	0.95 - 1.00	[g/cm^3]
Flash point (ISO 2719)	105	[°C]
Storage temperature (see expiry date on original container)	2 - 40	[°C]

STORAGE

Provided that Araldite® LY 564 and Aradur® 560 are stored in a dry place in their original, properly closed containers at the above mentioned storage temperatures they will have the shelf lives indicated on the labels.

Partly emptied containers should be closed immediately after use.

* *In addition to the brand name product denomination may show different appendices , which allows us to differentiate between our production sites: e.g , BD = Germany, US = United States, IN = India, CI = China, etc.. These appendices are in use on packaging, transport and invoicing documents. Generally the same specifications apply for all versions. Please address any additional need for clarification to the appropriate Huntsman contact.*

PROCESSING DATA

MIX RATIO

Components	*Parts by weight*	*Parts by volume*
Araldite® LY 564	100	100
Aradur® 560	27	32

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.

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.

INITIAL MIX VISCOSITY

(ISO 12058-1)

[°C]	*[mPa s]*
at 25	600 - 1000
at 40	200 - 250

VISCOSITY BUILD-UP

(ISO 12058-1)

[°C]	*[mPa s]*	*[min]*
at 25	to 1500	15 - 25
at 25	to 3000	20 - 50
at 40	to 1500	17 - 25
at 40	to 3000	22 - 30

POT LIFE

(TECAM, 100 ML, 65 % RH)

[°C]	*[min]*
at 25	20 - 25

GEL TIME

(HOT PLATE)

[°C]	*[min]*
at 25	600
at 40	75 - 85
at 60	20 - 30
at 80	5 - 9
at 100	1 - 3
at 120	0.5 - 1.5

The values shown are for small amounts of pure resin/hardener mix. In composite structures the gel time can differ significantly from the given values depending on the fibre content and the laminate thickness.

TYPICAL CURE CYCLES

15 h 50 °C
or 4 h 80 °C
or 2 h 100 °C

The optimum cure cycle has to be determined case by case depending on the processing and the economic requirements.

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PROPERTIES OF THE CURED, NEAT FORMULATION

GLASS TRANSITION TEMPERATURE (T_G) (IEC 1006,10 K/MIN)	*Cure:*	*T_G) [°C]*
	7 days 25 °C	46 - 55
	15 h 50 °C	74 - 85
	15 h 60 °C	77 - 86
	4 h 80 °C	90 - 100
	4 h 100°C	90 - 100

TENSILE TEST (ISO 527)		*Cure:*	*7 days RT*	*15 h 50 °C*	*4 h 80 °C*
	Tensile strength	[MPa]	61 - 67	78 - 82	74 - 80
	Ultimate elongation	[%]	1.90 - 2.20	5.00 - 5.50	4.50 - 7.50
	Tensile modulus	[MPa]	3650 - 3800	3380 - 3560	3000 - 3200

FLEXURAL TEST (ISO 178)		*Cure:*	*4 h 80 °*
	Flexural strength	[MPa]	128 - 140
	Elongation at flexural strength	[%]	6.20 - 7.20
	Ultimate strength	[MPa]	120 - 132
	Ultimate elongation	[%]	8.50 - 10.20
	Flexural modulus	[MPa]	2900 - 3200

FRACTURE PROPERTIES BEND NOTCH TEST (PM 258-0/90)		*Cure:*	*15 h 50 °C*
	Fracture toughness K_{1C}	[MPa√m]	0.69 -0.76
	Fracture energy G_{1C}	[J/m^2]	120 - 140

WATER ABSORPTION (ISO 62)	*Immersion:*	*Cure:*	*7 days R*	*15 h 50 °C +*	*4 h 80 °C*
	4 days H_2O 23 °C	[%]	0.68	0.54	0.34
	10 days H_2O 23 °C	[%]	1.15	1.02	0.72
	30 min H_2O 100 °C	[%]	0.80	0.74	0.66
	60 min H_2O 100 °C	[%]	1.14	1.10	1.04

COEFFICIENT OF LINEAR THERMAL EXPANSION (DIN 53 752)		*Cure:*	*15 h 50 °C*
	Mean value up to 80 °C	[10^{-6}/K]	70 - 75

POISON'S RATIO	[μ]	0.35

PROPERTIES OF THE CURED, NEAT FORMULATION

FLEXURAL TEST
(ISO 178)

Samples:
16 layers (4 mm)
E-glass fabric 1:1, 280 - 300 g/cm^2
Fibre volume content : 45 - 46 %

	Cure:	*7 days RT*	*15 h 50 °C*
Ultimate strength	[MPa]	440 - 455	495 - 515
Ultimate elongation	[%]	2.70 - 3.00	3.00 - 3.30
Flexural modulus	[MPa]	21500 - 22500	20500 - 21500

TENSILE, COMPRESSIVE AND TORSIONAL TEST
(TCT)

Samples : Glass Roving: OCF 859 – 885 Tex
Fibre weight content: 78.50 – 80.50 %

Transverse tensile test	*Cure:*	*7 days RT*	*15 h 50 °C*
Tensile strength	[MPa]	40 - 44	38 - 41
Tensile strain	[%]	2.00 - 2.20	2.10 - 2.30
Elastic modulus	[MPa]	19500 - 21000	18700 - 20200

Torsional test	*Cure:*	*7 days RT*	*15 h 50 °C*
Shear strength	[MPa]	55 - 57	61 – 63
Shear angle	[%]	20 - 37	37 – 45
Shear modulus	[MPa]	7000 - 8500	6900 - 7300

Transverse compressive test	*Cure:*	*7 days RT*	*15 h 50 °C*
Compressive strength	[MPa]	120 - 130	120 - 140
Compressive strain	[%]	8 - 10	12 - 13
Elastic modulus	[MPa]	18000 - 19500	16500 - 18500

INTERLAMINAR SHEAR STRENGTH
(ASTM D 2344)

Short beam: E-glass unidirectional specimen
Laminate thickness t = 3.2 mm
Fibre volume content: 60 %

	Cure:	*1 h 80 °C + 8 h 140 °C*
Shear strength	[MPa]	59 - 63

HANDLING PRECAUTIONS

Personal hygiene	
Safety precautions at workplace	
protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
goggles/safety glasses	yes
Skin protection	
before starting work	Apply barrier cream to exposed skin
after washing	Apply barrier or nourishing cream
Cleansing of contaminated skin	
	Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents
Disposal of spillage	
	Soak up with sawdust or cotton waste and deposit in plastic-lined bin
Ventilation	
of workshop	Renew air 3 to 5 times an hour
of workplaces	Exhaust fans. Operatives should avoid inhaling vapours

FIRST AID

Contamination of the *eyes* by resin, hardener or mix should be treated immediately by flushing with clean, running water for 10 to 15 minutes. A doctor should then be consulted.

Material smeared or splashed on the *skin* should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A doctor should be consulted in the event of severe irritation or burns. Contaminated clothing should be changed immediately.

Anyone taken ill after *inhaling* vapours should be moved out of doors immediately.

In all cases of doubt call for medical assistance.

temperature, and other variables, which are not known to Huntsman Advanced Materials. It is the responsibility of the user to evaluate the manufacturing circumstances and the final product under actual end-use requirements and to adequately advise and warn purchasers and users thereof.

Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Advanced Materials containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

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