

Advanced Materials**Araldite® LY 556* / Aradur® 906* / Accelerator DY 070*****HOT CURING EPOXY MATRIX SYSTEM**

Araldite® LY 556 is an epoxy resin
 Aradur® 906 is an anhydride hardener
 Accelerator DY 070 is an imidazol accelerator

APPLICATIONS	High performance composite parts		
PROPERTIES	Reactive diluent free matrix system with a very long pot life. The reactivity can be adjusted by varying the accelerator content. The system has very good high temperature performance after post cure and exhibits good mechanical and dynamic properties.		
PROCESSING	Filament Winding Pressure Moulding Pultrusion		
KEY DATA	Araldite® LY 556		
	Aspect (visual)	clear, pale yellow liquid	
	Colour (Gardner, ISO 4630)	≤ 2	
	Epoxy content	5.30 - 5.45	[eq/kg]
	Viscosity at 25 °C (ISO 12058-1)	10000 - 12000	[mPa s]
	Density at 25 °C (ISO 1675)	1.15 - 1.20	[g/cm ³]
	Flash point (ISO 2719)	> 200	[°C]
	Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]
	Aradur® 906		
	Aspect (visual)	clear, pale yellow liquid	
	Colour (Gardner, ISO 4630)	≤ 2	
	Viscosity at 25 °C (ISO 12058-1)	175 - 350	[mPa s]
	Density at 25 °C (ISO 1675)	1.20 - 1.25	[g/cm ³]
	Flash point (ISO 2719)	> 135	[°C]
	Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]
	Accelerator DY 070		
	Aspect (visual)	clear liquid	
	Colour (Gardner, ISO 4630)	≤ 9	
	Viscosity at 25 °C (ISO 12058-1)	≤ 50	[mPa s]
	Density at 25 °C (ISO 1675)	0.95 - 1.05	[g/cm ³]
	Flash point (ISO 2719)	> 92	[°C]
	Storage temperature	2 - 40 °C	[°C]

* 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.

(see expiry date on original container)

STORAGE

Provided that the products described above 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. Because Aradur[®] 906 is sensitive to moisture, storage containers should be ventilated with dry air only. Araldite[®] LY 556 which has crystallized and looks cloudy can be restored to its original state by heating to 60 - 80 °C.

PROCESSING DATA

MIX RATIO

<i>Components</i>	<i>Parts by weight</i>	<i>Parts by volume</i>
Araldite [®] LY 556	100	100
Aradur [®] 906	95	92
Accelerator DY 070	0.5 - 2	0.6 - 2.4

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.

PROCESSING RECOMMENDATIONS

To simplify the mixing process the resin can be preheated to about 30 °C to 50 °C before adding the cold hardener.

Hardener and accelerator can be premixed, thus allowing the use of two component mixing/metering equipment. The mix of hardener and accelerator has a shelf life of at least 1 day.

The impregnation bath should be heated to 35 - 45 °C in order to ensure optimum wetting of fibres. The mandrel should be heated to 60 - 110 °C during the filament winding process.

The gelation temperature should not be higher than absolutely necessary. A high gelation temperature induces high shrinkage and generates internal stresses.

INITIAL MIX**VISCOSITY**

(HOEPLER, ISO 12058-1B)

<i>Mixture with 1 pbw of Accelerator DY 070</i>	<i>[°C]</i>	<i>[mPa s]</i>
	at 25	1900 - 2100
	at 40	400 - 500

POT LIFE

(TECAM, 100 ML, 65 % RH)

	<i>[°C]</i>	<i>[h]</i>
	at 25	50 - 55
	at 40	37 - 42

GEL TIME

(HOT PLATE)

	<i>[°C]</i>	<i>[min]</i>
	at 120	14 - 16
	at 140	4 - 6
	at 160	1 - 2

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

2 h 120 °C + 8 h 160 °C
or 2 h 120 °C + 8 h 180 °C

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

PROPERTIES OF THE CURED, NEAT FORMULATION

GLASS TRANSITION TEMPERATURE (T_G) (IEC 1006, 10 K/MIN)	Cure:	T_G TMA [°C]	T_G DSC [°C]
	8 h 120 °C	130 - 136	140 - 146
	2 h 120 °C + 8 h 140 °C	160 - 165	165 - 170
	2 h 120 °C + 2 h 160 °C	160 - 165	165 - 170
	2 h 120 °C + 8 h 160 °C	160 - 165	165 - 175
	2 h 120 °C + 2 h 180 °C	160 - 165	165 - 175
	2 h 120 °C + 8 h 180 °C	165 - 170	165 - 180
	2 h 120 °C + 2 h 160 °C + 2 h 180 °C	165 - 170	175 - 180

Cure temperatures above 130 °C may lead to a brownish colouration of the epoxy system. This colouration does not influence the properties of the system.

TENSILE TEST (ISO 527)	Cure:		2 h 120 °C + 8 h 160 °C
Tensile strength	[MPa]		45 - 60
Ultimate elongation	[%]		1.5 - 2.5
Tensile modulus	[MPa]		2700 - 3000
FLEXURAL TEST (ISO 178)	Cure:		2 h 120 °C + 8 h 160 °C
Flexural strength	[MPa]		100 - 140
Ultimate elongation	[%]		4 - 7
Flexural modulus	[MPa]		2900 - 3100
FRACTURE PROPERTIES BEND NOTCH TEST (PM 258-0/90)	Cure:		2 h 120 °C + 8 h 160 °C
Fracture toughness K_{1C}	[MPa \sqrt{m}]		0.6 - 0.75
Fracture energy G_{1C}	[J/m 2]		100 - 125
WATER ABSORPTION (ISO 62)	Immersion:	Cure:	2 h 120 °C + 8 h 160 °C
1 day H $_2$ O 23 °C	[%]		0.15 - 0.17
10 days H $_2$ O 23 °C	[%]		0.48 - 0.52

PROPERTIES OF THE CURED, REINFORCED FORMULATION

INTERLAMINAR SHEAR STRENGTH (ASTM D 2344)	Short beam: E-glass unidirectional specimen Laminate thickness t = 3.2 mm Fibre volume content: 59 - 62 %		
		Cure:	2 h 120 °C + 8 h 160 °C
Shear strength	[MPa]		69 - 75
TENSILE TEST, TRANSVERSE STRESS	Test specimens: unidirectionally wound tubes		
E-glass	Roving	E-glass roving, 1200 tex, silane finish	
	Fibre volume content	66 %	
	Gelation temperature	100 °C	
	Cure	2 h 120 °C + 8 h 160 °C	
Carbon	Roving	Torayca T 300 B	
	Fibre volume content	58 %	
	Gelation temperature	100 %	
	Cure	2 h 120 °C + 8 h 160 °C	
Tensile strength	[MPa]	E-glass	Carbon
		63 - 73	78 - 85

**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.

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Main Office :
Huntsman Advanced Materials (Switzerland) GmbH
Klybeckstrasse 200
4057 BASEL
Switzerland
+41 61 966 3333