

Araldite[®] LY 1556 / Aradur[®] 917 / Accelerator DY 070

Hot Curing Epoxy Matrix System

Chemical Description Araldite LY 1556 with Aradur 917 and Accelerator DY 070 is a low viscosity, solvent-free laminating system based on bisphenol A epoxy resin and an anhydride curing agent. By varying the DY 070 accelerator content, reactivity can be adapted to suit the processing and curing conditions. Its low viscosity and long pot life make it especially suitable for wet filament winding, pultrusion and resin transfer molding. The system exhibits good fiber impregnation properties and processing ease. The cured system shows excellent mechanical, dynamic, and thermal properties as well as good chemical resistance.

Advantages Low room temperature viscosity
Long pot life, reactivity is adjustable by varying accelerator content
Good chemical resistance, especially to acids at temperatures up to 80°C
Fulfills MIL Specification R 9300

Processing Methods Wet Filament Winding
Wet Tape Winding
Pultrusion
Resin Transfer Molding (RTM)

Typical Properties*

Araldite LY 1556	
Visual Appearance	Clear, no contamination
Color, Gardner, max	1
Epoxy Value, eq./kg	5.2 - 5.5
Epoxy Equivalent, g/eq.	182 - 192
Viscosity @ 25°C (77°F), mPa s (cPs)	10,000 - 12,000
Density @ 25°C (77°F), g/cm ³ (lb/gal.)	1.15 - 1.18 (9.6 - 9.8)
Aradur 917	
Visual Appearance	clear liquid
Color, Gardner, max	2
Viscosity @ 25°C (77°F), mPa s (cps)	50 - 100
Density @ 25°C (77°F), g/cm ³ (lb/gal.)	0.93 - 0.95 (7.8 - 7.9)
Accelerator DY 070	
Visual Appearance	clear liquid
Color, Gardner, max	3
Viscosity @ 25°C (77°F), mPa s (cps)	<50
Density @ 25°C (77°F), g/cm ³ (lb/gal.)	0.95-1.05 (7.9 - 8.8)

* Typical properties are based on Huntsman's test methods. Copies are available upon request.

Mix Ratio		Parts by Weight	Parts by Volume
	Araldite LY 1556	100	100
	Aradur 917	90	86
	Accelerator DY 070	0.5-2	0.6-2.4

Processing Hints

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 (it is preferred to mix at 60°C), thus allowing the use of two component mixing/metering equipment. The mix of hardener and accelerator has a shelf life of about 1 month.

The processing of the system at elevated temperatures of 30°C to 40°C shows the best results.

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

Initial Mix Viscosity			
	Hoeppler at 25°C	[cP]	600-900
	at 40°C	[cP]	200-300
	at 60°C	[cP]	< 75

Mix Ratio		System 1	System 2	System 3
	Araldite LY 1556, [pbw]	100	100	100
	Aradur 917, [pbw]	90	90	90
	Accelerator DY 070, [pbw]	0.5	1	2

Pot Life				
	Tecam			
	100 g at 23°C, [hrs]	165-175	95-105	48-54
	at 40°C, [hrs]	5-7	4-5	-

Viscosity Build Up				
	Hoeppler			
	at 25°C, to 1500 cP, [hrs]	10-12	3.5-4.5	1.5-2
	to 3000 cP, [hrs]	33-37	16-18	6-7
	at 40°C, to 1500 cP, [hrs]	19-21	7-8	3-4
	to 3000 cP, [hrs]	23-26	9-10	4-5
	at 80°C to 1500 cP, [min]	95-105	52-57	32-35
	to 3000 cP, [min]	105-115	60-65	35-38
	at 90°C to 1500 cP, [min]	-	-	14-16
	to 3000 cP, [min]	-	-	15-17

Gel Time				
	Hot Plate			
	at 80°C [min]	230-270	140-160	65-75
	at 100°C [min]	65-75	35-45	18-22
	at 120°C [min]	21-25	10-12	5-7
	at 140°C [min]	7-9	3-5	1-3
	at 160°C [min]	2-4	1-2	-

The figures shown are for small amounts of pure resin / hardener / accelerator mix. In practice, fiber content and laminate thickness may modify gel time to a very significant extent.

Typical Cure Cycles	Gelation Post-cure	2-4 hours at 80°C 4-8 hours at 120°C	or 1-3 hours at 90°C or 2-8 hours at 140°C or 2-8 hours at 160°C
Cure temperatures in excess of about 130°C cause brown discoloration but does not impair the properties of the product. Unless otherwise stated, the processing schedule for the samples tested was gelation for 4h / 80°C and post-cure for 8 hrs / 140°C.			
Glass Transition Temperature	Gelation	Cure	T _g (DSC) T _g (TMA)
	4 hrs / 80°C	4 hrs / 120°C [°C]	140-144 124-128
	4 hrs / 80°C	8 hrs / 120°C [°C]	144-148 125-128
	4 hrs / 80°C	4 hrs / 140°C [°C]	145-150 130-135
	4 hrs / 80°C	8 hrs / 140°C [°C]	148-153 135-145
	4 hrs / 80°C	4 hrs / 160°C [°C]	150-155 140-145
	4 hrs / 80°C	8 hrs / 160°C [°C]	150-155 140-145
Tensile Test	Tensile strength	[kpsi]	12.0-13.5
	Elongation at tensile strength	[%]	4.2-5.6
	Ultimate strength	[kpsi]	11.6-13.1
	Ultimate elongation	[%]	5.0-7.0
	Tensile modulus	[kpsi]	450-479
Fracture Properties	Stress intensity factor K _{1C}	[MPa m ^{1/2}]	0.58±0.02
	Fracture energy G _{1C}	[J/m ²]	92±4
Flexural Test	Unconditioned		
	Flexural strength	[kpsi]	18.1-19.6
	After 10 days in H₂O/23°C		
	Flexural strength	[kpsi]	16.0-17.4
	After 60 min in H₂O/100°C		
	Flexural strength	[kpsi]	18.1-19.6
Impact Test	Strength unnotched test bar	kJ/m ²	15-20
Water Absorption	1 day H ₂ O / 23°C	[%]	0.10-0.15
	10 days H ₂ O / 23°C	[%]	0.30-0.40
	30 min H ₂ O / 100°C	[%]	0.10-0.15
	60 min H ₂ O / 100°C	[%]	0.15-0.20
Coefficient of Linear Thermal Expansion	Mean value from 20°C to 100°C		
	α	10 ⁻⁶ /K	55-57
	Mean value from 100°C to 130°C		
	α	10 ⁻⁶ /K	67-70
Poisson's Ratio	μ		0.35

Laminate Properties 1		Unless otherwise stated, the figures given are for stop-pressed laminate samples comprising 16 layers (4 mm) of E glass fabric 1:1, 280-300 g/m ² . Fiber volume content: 42-47	
Flexural Test	Unconditioned		
	Flexural strength	[kpsi]	75.4-79.8
	Flexural modulus	[mpsi]	2.39-2.42
	After 10 days in H₂O/23°C		
	Flexural strength	[kpsi]	56.6-59.5
	After 60 min in H₂O/100°C		
Flexural strength	[kpsi]	66.7-69.6	
Interlaminar Shear Strength ILSS	Short beam : E-glass unidirectional specimen, thickness t =3.2 mm Fiber volume content : 60%		
	Shear strength	[kpsi]	75-77
Water Absorption	1 day H ₂ O / 23°C	[%]	0.15-0.20
	10 days H ₂ O / 23°C	[%]	0.25-0.30
	30 min H ₂ O / 100°C	[%]	0.01-0.05
	60 min H ₂ O / 100°C	[%]	0.03-0.07
Laminate Properties 2 and 3	E-glass	Roving	E-glass roving, 1200 tex, silane finish
		Fiber volume content Gelation temperature Post-cure	67% 90°C 8 hours at 140°C
	Carbon HT	Roving	Carbon fiber high tensile, Torayca T 300B-6000-50B
		Fiber volume content Gelation temperature Post-cure	64% 90°C 8 hours at 140°C
Tensile Test Transverse Stress			E-glass Carbon HT
	Tensile strength $\sigma_{\perp T}$	[mpsi]	6.96-7.98 11.2-12.3
	Tensile strain $E_{\perp T}$	[%]	0.25-0.33 0.9-1.0
	Elastic modulus $E_{\perp T}$	[mpsi]	2.61-2.90 1.35-1.44
Compressive Test Transverse Stress	Compressive strength $\sigma_{\perp C}$	[kpsi]	23.9-25.4 276-29.9
	Compressive strain at Break	[%]	1.2-1.4 2.7-3.4
	Elastic modulus $\Sigma_{\perp C}$	[mpsi]	2.90-3.19 1.41-1.44
Torsional Test	Shear strength T#	[kpsi]	11.2-11.9 11.0-11.6
	Shear angle Y#	[%]	2.7-3.1 3.3-4.0
	Shear modulus G#	[mpsi]	0.88-1.03 0.87-0.91

Packaging & Storage

Provided that the products described above are stored in their original, properly closed containers at the appropriate conditions (see Product Data) and in a dry place, they will have the shelf lives shown on the labels.

Partly emptied containers should be closed immediately after use. Because Aradur 917 is sensitive to moisture, storage containers should be ventilated with dry air only.

Resin which has crystallized and looks cloudy can be restored to its original state by heating to 60-80°C.

Handling/Safety Precautions

Mandatory and recommended industrial hygiene procedures should be followed whenever our products are being handled and processed. For additional information please consult the corresponding product safety data sheets and the brochure.

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

First Aid**In case of contact:**

Eyes: Immediately flush eyes for at least 15 minutes with running water. Hold eyelids apart to ensure rinsing of the entire eye surface and lids with water. If physician is not available, flush for an additional 15 minutes. Get immediate medical attention.

Skin: Immediately remove contaminated clothing and shoes under a safety shower. Wash affected areas thoroughly with large amounts of water, and soap if available, for at least 15 minutes. Get immediate medical attention. Discard or decontaminate clothing before re-use and destroy contaminated shoes.

Inhalation: Removed from area to fresh air. If not breathing, give artificial respiration. Get immediate medical attention. If breathing is difficult, transport to medical care and, if available, give supplemental oxygen.

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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