

## Araldite<sup>®</sup> CY 179-1 US Resin

### Product Description

Araldite<sup>®</sup> CY 179-1 US is a very low viscosity resin, which offers high temperature performance, low and stable dielectric properties and superior arc, tracking and UV resistance. This product is recommended for the manufacture of high voltage electrical components to be used in aggressive outdoor environments.

### Applications

- Insulators
- Bushings
- Transformers
- Wire and cable insulation
- Electrical connectors and generators
- Motors
- Switchgear components

### Features

- Low viscosity coupled with long working life
- High heat deflection temperature
- Excellent dielectric properties that remain low over a wide range of temperatures
- Superior arc, corona and tracking resistance
- High endurance under outdoor (UV) exposure

### Typical Properties\*

Property	Value
Color, APHA	100 maximum
Epoxy Value, eq./kg	6.80 - 8.00
Epoxy Equivalent, g/eq.	128 - 145
Density @ 25°C (77°F), g/cm <sup>3</sup>	1.15 - 1.18
Flash Point, Closed Cup, °C (°F)	118 (245)
Viscosity, cP @ 25°C (77°F)	100 - 600

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

## Formulations

Although Araldite® CY 179-1 US may be cured with nearly all carboxylic acid anhydrides, Aradur® HT 907 is best recommended for outdoor electrical applications. Such systems offer superior arc & track resistance, excellent mechanical & electrical properties and very good handling characteristics, especially when used in conjunction with Accelerator DY 183.

The properties of Araldite® CY 179-1 US systems at room temperature can be enhanced by the incorporation of the Flexibilizer DY 040. For example, by adding DY 040 at levels of 10-40 phr, it is possible to improve the handling characteristics of the mixture, reduce the raw material cost and improve the mechanical performance of the cured system (phr = parts per hundred parts, by weight, of resin).

Accelerator DY 183 is used at levels up to 12 phr, dependent upon the mass and desired speed of cure.

The Araldite® cycloaliphatic epoxy systems exhibit a sharp decrease in viscosity with temperature. These low viscosities permit the incorporation of large proportions of inorganic fillers, e.g., over 400 phr. or 65% by weight. The use of such fillers is recommended for casting for electrical or electronic applications to reduce exotherm, shrinkage, coefficient of linear thermal expansion, as well as cost.

## Processing

Araldite® CY 179-1 US is preheated to a temperature greater than the melting point of the anhydride used, e.g 50°C-60°C (120°F- 140°F) when using Aradur® HT 907. Aradur® HT 907 in its liquid state (>40°C or 104°F) can then be added and mixed readily with the resin. The mixture can then be cooled to room temperature if desired. Accelerators and/or other modifiers such as DY 040 should then be added to the resin/hardener mixture at the desired process temperature. Separate mixtures of DY 040 and anhydride are to be avoided since there is a risk of a reaction between such components.

Casting is best accomplished by using molds preheated to a temperature approximately 10°C higher than that of the casting mixture. A practical procedure is to first mix the resin, hardener and modifier; then stir in the filler. Mix thoroughly under vacuum of 2 to 6 torr to de-air. The accelerator is best added last, immediately prior to casting. The pot life at room temperature, as measured by viscosity versus time, is in excess of eight hours. One hundred phr Araldite® CY 179 US + 105 phr Aradur® HT 907 + 12 phr Accelerator DY 183 remains below 4000 cP for 16 hours at 25°C, exhibiting an initial viscosity of > 400 cP.

### Processing Data

Araldite® CY 179-1 US systems containing Accelerator DY 183, Aradur® HT 907 and DY 040 exhibit the following typical processing characteristics at elevated temperatures:

Formulation, pbw	1	2	3	4	5	6
Araldite® CY 179-1 US	100	100	100	100	100	100
Aradur® HT 907	105	105	105	105	105	105
Accelerator DY 183	12	12	12	12	12	12
Flexibilizer DY 040	-	10	20	30	40	40
325 mesh silica	-	-	-	-	450	-
Hydrated alumina (~7µm)	-	-	-	-	-	450
Initial Viscosity, cP						
at 40°C, (104°F)	150-170	200-220	220-250	230-270	-	-
at 60°C, (140°F)	-	-	-	-	1000-2000	800- 2000
at 80°C, (176°F) (approx.)	7-10	10-15	15-20	25-30	-	-
Pot life to reach 1500 cP, hrs.						
at 40°C (104°F)	11-12	8-10	6-8	4-6	-	-
at 60°C (140°F)	-	-	-	-	4-5	4-5
at 80°C (176°F)	2-3	2.3	2-3	2-2	-	-

\*Resin hardener and filler were combined using mechanical stirring at 90°C. The accelerator was then stirred in and entire mix placed in oven at 100°C.

### Typical Physical Properties

Unless otherwise stated, the data were determined with typical cured production batches using standard test methods. They are typical values only, and do not constitute a product specification.

Curing is best accomplished by first gelling at 80°C to 120°C (176°F - 248°F 1 hour or more) followed by higher temperatures 120 - 200°C (243 - 392°F) dependent upon the system used and the properties desired. For the parts by weight composition of the tested cured formulations, see the table above.

Property	1	1	5	6
Cure Cycle for each formulation	Gel 1 h 120°C +3 h 120°C	Gel 2-4 h 80°C + 6-10 h 120°C + 4-6 h 140°C		
Density @ 25°C, g/cm <sup>3</sup>	1.17	1.20 - 1.25	1.75 - 1.80	1.70 - 1.75
Heat deflection temperature, °C (°F)	140 - 150 (284 - 302)	150 - 170 (302 - 338)	100 - 110 (212 - 230)	130 - 140 (266 - 284)
Water absorption, % 10 days @ 20°C 1 hr @ 100°C	- 0.30 - 0.35	0.55 - 0.60 0.45 - 0.50	0.29 - 0.33 0.33 - 0.37	0.31 - 0.35 0.25 - 0.29
Tensile strength, kpsi	9.5 - 10	-	9 - 11	4.3 - 5.7
Tensile modulus, kpsi	460 - 480	-	-	-
Elongation at failure, %	2.5 - 2.7	-	-	-
Flexural strength, kpsi	12.5 - 13	14 - 17	15 - 18	7 - 10
Flexural modulus, kpsi	430 - 440	-	-	-
Coefficient of linear thermal expansion in/in/°C x 10 <sup>-6</sup>	-	55 - 59	42 - 46	42 - 46

### Typical Electrical Properties

Property	1	1	5	6
Electrical Properties	@ 60 Hz	@ 50 Hz	@ 50 Hz	@ 50 Hz
Dielectric constant				
@ 25°C (77°F)	3.3 - 3.5	3.4 - 3.6	4.0 - 4.2	4.5 - 4.7
@ 60°C (140°F)	-	3.4 - 3.6	4.3 - 4.5	4.9 - 5.1
@ 90°C (194°F)	-	3.4 - 3.6	4.7 - 4.9	5.7 - 5.9
@ 100°C (212°F)	3.3 - 3.5	-	-	-
@ 150°C (302°F)	3.6 - 3.7	-	-	-
Dissipation factor				
@ 25°C (77°F)	0.004 - 0.006	0.004 - 0.006	0.030 - 0.040	0.015 - 0.020
@ 60°C (140°F)	-	0.004 - 0.005	0.040 - 0.050	0.050 - 0.060
@ 90°C (194°F)	-	0.004 - 0.005	0.050 - 0.060	0.090 - 0.110
@ 100°C (212°F)	0.004 - 0.006	-	-	-
@ 150°C (302°F)	0.006 - 0.008	-	-	-

Volume resistivity, $\Omega$ - cm				
@ 25°C (77°F)	-	$10^{16}$	$10^{16}$	$10^{16}$
@ 60°C (140°F)	-	$10^{16}$	$10^{16}$	$10^{16}$
@ 90°C (194°F)	-	$10^{16}$	$10^{16}$	$10^{16}$

### Effect of Flexibilizer DY 040 upon physical properties

Cure: Gel at 80°C (176°F) + 6 hours at 120°C (248°F) or Gel at 80°C (176°F) + 4 - 6 hours at 140°C (284°F)

Formulation	1	2	3	7	8	9
Araldite® CY 179 - 1 US	100	100	100	100	100	100
Aradur® HT 907	105	105	105	105	105	105
Accelerator DY 183	12	12	12	12	12	12
Flexibilizer DY 040	-	10	20	30	-	20
325 mesh silica	-	-	-	430	-	-
Hydrated alumina (~7 $\mu$ m)	-	-	-	-	430	470
Flexural strength, psi x10 <sup>6</sup>	14 - 17	14 - 17	17 - 20	17 - 20	7 - 10	7 - 10
Water absorption (specimen 60 x 10 x 4 mm), %						
4 days at 20°C	0.1 - 0.15	-	-	-	0.1 - 0.15	-
1 hour at 100°C	0.3 - 0.4	0.3 - 0.4	0.5 - 0.6	0.7 - 0.8	-	0.1 - 0.15
Deflection temperature						
°C	150 - 170	150 - 145	100 - 100	75 - 85	150 - 170	120 - 130
°F	302 - 330	275 - 293	212 - 230	167 - 185	302 - 338	248 - 266

### Storage

**Araldite® CY 179 - 1 US Resin** should be stored in a dry place, in the sealed original container, at temperatures between 2°C and 40°C (35.6°F and 104°F). Under these storage conditions, the shelf life is **6 years** (from date of manufacture). The product should not be exposed to direct sunlight.

## **Precautionary Statement**

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### **First Aid!**

Refer to SDS as mentioned above.

**KEEP OUT OF REACH OF CHILDREN**

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