Aradur® 956-2 Hardener

Product Description

Aradur® 956-2 Hardener is a versatile hardener that can be used for many applications, particularly adhesives, castings, encapsulation and potting compounds where its low viscosity and low shrinkage are advantageous. It is based on triethylene tetramine (TETA) and is chemically modified to facilitate the formulation of systems made with Araldite® liquid epoxy resins, fillers and other modifiers for curing at ambient or elevated temperature.

Applications

- Adhesives
- Castings
- Encapsulation and potting
- Laminating
- Tooling
- Solvent-free and high-solids coatings and floorings
- Accelerator for slower curing epoxy systems

Features

- Low viscosity
- Low shrinkage
- Fast curing
- Good chemical resistance
- Excellent electrical and mechanical properties

Typical Properties*

Property	Aradur® 956-2
Appearance	Clear, no contamination
Color, Gardner, max	4
Amine value, mg KOH/g	1020 - 1080
H^+ active equivalent, g/eq	47
Viscosity @ 25°C, cP	290 - 500
Density @ 25°C, g/cm^3	1.02
Flash point, closed cup, °C	>93

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

Processing

Clear Coating Starting Formulations (parts by weight)

Product	1	2
Araldite® GY 6010[1]	100	90
Araldite® DY-E[2]	-	10
Aradur® 956-2	25	24

[1]Standard bisphenol-A liquid epoxy resin (epoxy equivalent weight: 182 - 192)
[2]Reactive diluent (mono-glycidyl ether of C12 - C14 alcohol; epoxy equivalent weight: 275 - 315)

Processing Data

Parameter	1	2	Test Method
Mix viscosity @ 25°C, cP	3000	1350	ASTM D4440 (ICI Cone & Plate)
Gel time, 100 g, 23°C, min	27	35	Gardco® gelation timer, Model GT-S

Typical Physical Properties

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

Property	1	2	Test Method
Tack-free time, hours @ 23°C / 50% R.H. @ 5°C / 50% R.H.	 2 6	 3 9	Gardner circular drying time recorder on 10 mil wet coating
Cure-through time, hours @ 23°C / 50% R.H. @ 5°C / 50% R.H.	 3 12	 5 18	Gardner circular drying time recorder on 10 mil wet coating
Film appearance @ 23°C / 50% R.H. @ 5°C / 50% R.H.	 Heavy Blush Blush	 Blush Blush	Visual
Gloss (20° / 60°) (%) @ 23°C / 50% R.H. @ 5°C / 50% R.H.	 13/31 27/66	 11/42 17/51	ASTM D523

Coating properties, 10-mil, 7 days @ 23°C / 50% Relative Humidity

Property	1	2	Test Method
Pencil hardness	F	F	ASTM D3363
Persoz hardness, s	224	148	ANSI/ISO 1522
X-Cut adhesion	5A	5A	ASTM D3359
Impact resistance (Direct/Rev.), in·lb	14	22	ASTM D2794
Mandrel bend	Fail 1”	1”	ASTM D522
Glass transition temp., T_g, °C	57.9	53.7	DSC
Shore D Hardness, 1/8” thickness 1 day 3 days 7 days	 81 81 81	 81 81 81	ASTM D2240
Time to water spot resistance,* h	---	---	--
Taber Abrasion, mg	43	59	ASTM C1353
Pull-Off Adhesion, 5-mil wet film, psi Sandblasted Concrete (failure mode) Sandblasted Steel	 400 Concrete 1000	 --- --- 1000	ASTM D4541

* Place a droplet of deionized water on coating periodically beginning at the tack-free time and continually throughout the cure cycle. Record the time at which no visible defect is seen on the coating film after evaporation of the droplet.

Mechanical Properties 7 days @ 23°C / 50% Relative Humidity

Property	1	2	Test Method
Flexural strength, kpsi	22.5	18.7	ASTM D 790
Flexural modulus, kpsi	738.8	722.4	ASTM D 790
Compressive strength, kpsi	42.4	38.9	ASTM D 695
Compressive modulus, kpsi	486.3	548.1	ASTM D 695
Max. compression load, lbs	8320.6	7630.0	ASTM D 695
Tensile strength, kpsi	10.6	7.7	ASTM 638
Tensile modulus, kpsi	515.4	504.5	ASTM 638
Tensile elongation, %	2.6	4.9	ASTM 638
Heat deflection temperature, °C			ASTM 648
66 psi	61	51.4	
264 psi	56	50	

Chemical Resistance*Spot Test Formulation 1

Exposure time, hours	24	48	72
Acetic Acid, 10%	<6B	Destroyed	Destroyed
Ammonia, 25%	F	F	F
Brake Fluid	<6B	<6B	<6B
Ethanol, 50%	B	2B	2B
Hydrogen Peroxide, 3%	F	F	F
Hydrochloric Acid, 20%	F	F	F
Methyl Isobutyl Ketone	2B	3B	3B
Nitric Acid, 10%	F	F	F
Skydrol 500B	F	F	F
Tap Water	F	F	F
Xylene	3B	3B	3B

*Cure: 7 days @ 23°C / 50% RH; Coating: 10-mil film on cold rolled steel; Evaluated by change in pencil hardness

Chemical Resistance*Spot Test Formulation 2

Exposure time, hours	24	48	72
Acetic Acid, 10%	Destroyed	Destroyed	Destroyed
Ammonia, 25%	HB	HB	HB
Brake Fluid	<6B	<6B	<6B
Ethanol, 50%	B	2B	3B
Hydrogen Peroxide, 3%	F	F	F
Hydrochloric Acid, 20%	F	F	F
Methyl Isobutyl Ketone	3B	3B	3B
Nitric Acid, 10%	F	F	F
Skydrol 500B	F	F	F
Tap Water	F	F	F
Xylene	<6B	<6B	<6B

*Cure: 7 days @ 23°C / 50% RH; Coating: 10-mil film on cold rolled steel; Evaluated by change in pencil hardness

Additional Performance Data

Product/Property	Formulation 3
Araldite® GY 6005[1]	100
Aradur® 956-2 Hardener	25
Pot life, 30 gram mass, min @ 25°C @ 40°C @ 60°C	 35 20 10
Gel time, 25°C (min) 3.5-in layer 3/8-in layer	 20 35
Full cure schedule, time @ 25°C @ 40°C @ 100°C	 5 - 7 days 16 - 24 h 2 - 8 h
Flexural strength,[2] kpsi	17.5
Tensile strength, [2] kpsi	10.5
Deflection temperature, [2] °C	100
Dielectric constant[3] @ 60 Hz @ 106 Hz	 4.6 3.7
Power factor[3] @ 60 Hz @ 106 Hz	 0.015 0.037

Volume resistivity,[3] Ω·cm	
@ 25°C	1.0×10^{16}
@ 100°C	1.7×10^{10}
@ 149°C	$> 1.0 \times 10^{8}$

[1]Reactive diluent-modified bisphenol-A liquid epoxy resin (epoxy equivalent weight: 182 - 196)
[2]Cure Schedule: Gel at room temperature, then 2 hr at 100°C
[3]Cure Schedule: Gel at room temperature, then 8 hr at 100°C

Product/Property*	4	5	6
Araldite® GY 502[1]	100	100	100
Aradur® 956-2 Hardener	20	20	25
Silica Flour	-	150	-
Marble Flour	-	-	150
Flexural strength, kpsi	13.5	8.5	10.0
Tensile strength, kpsi	9.3	7.8	7.1
Compressive strength, kpsi	12.8	18.5	17.8
Impact strength, in·lb	67	34	22
Heat distortion temperature, °C	50	55	55
Coefficient of linear thermal expansion, °C	51	30	30
Water absorption, % wt.	0.65	0.22	0.41
Modulus of elasticity, $x10^5$	5.1	19.0	21.0
Dielectric strength, 25°C 50 Hz	4.4	4.6	4.6
Surface resistivity, Ω·cm	12	13	13

*All properties were tested on samples cured 10 h at 25°C, then 1 h at 100°C
[1]Bisphenol-A liquid epoxy resin modified with dibutyl phthalate (epoxy equivalent weight: 222 - 238)

Storage

Aradur® 956-2 Hardener should be stored in a dry place, in the sealed original container, at temperatures between 2°C and 40°C (36°F and 104°F). Under these storage conditions, the product has a shelf life of **3 years** (from date of manufacture). The product should not be exposed to direct sunlight.

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First Aid!
Refer to SDS as mentioned above.

KEEP OUT OF REACH OF CHILDREN

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