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Advanced Materials

Araldite® CW 5908 Resin
Aradur® HW 5909 Hardener

TWO-COMPONENT EPOXY WITH EXCELLENT ARC TRACK RESISTANCE

Description

Araldite® CW 5908 resin with Aradur® HW 5909 hardener is a cycloaliphatic, prefilled, hot-curing, two component epoxy casting system recommended for outdoor applications in the medium voltage and heavy power electrical industry. The product offers high thermal shock resistance combined with high glass transition temperature.

Applications

155ºC (311ºF) Continuous rating by IEC 216 Standards
Outdoor electrical insulating components
Bushings
Line post and pin insulators in the medium voltage range.
All components for humid indoor medium and high voltage environments
Excellent indoor and outdoor switchgear components

Advantages

Easy handling combined with long pot-life at moderate temperature
Short gel and demolding time at temperature above 140°C (284ºF)
High tracking and arc resistance
Good toughness combined with elevated glass transition temperature
Very high erosion resistivity under Ultra Violet Radiation
High stability of the dielectric properties also in humid atmosphere
Insulating material with excellent outdoor behavior

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Typical Properties

Test Values

Property	5908	5909
Specific Gravity	1.74 – 1.80	1.77 – 1.83
Viscosity, @ 40ºC (104ºF), cP	12,000 – 24,000	7,500 – 15,000
As supplied form	Gray viscous liquid	Beige viscous liquid
Flash Point, Closed Cup, ºC (ºF)	> 200 (>392)	165 (329)
Vapor Pressure @ 25ºC (77ºF), N/m^2	< 0.01	< 0.3

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

Packaging & Storage

Araldite® CW 5908 resin: Store at 21-32ºC (70-90°F) in a dry and well-sealed condition, if possible, in original containers. If only part of container is used, re-close to prevent contamination.

Aradur® HW 5909 hardener: Store at 21-32ºC (70-90°F) in a dry well-sealed condition, if possible in original containers. This product is moisture sensitive and packaged under a blanket of dry nitrogen. Maintain factory seal. If only part of container is used, blanket with dry nitrogen and tightly re-seal.

Under these conditions their shelf lives will be one year from date of shipping. Contact Customer Service for packaging information.

System Preparation

The two components should be mixed in the desired quantity under vacuum and at slight elevated temperature (up to 60°C/140ºF). For mixing of medium- to high- viscous casting resin systems and for mixing at lower temperatures, we recommend special thin film de-gassing mixers that may produce additional self-heating of 10ºC -15 °C (50ºF – 29ºF) as a result of friction. Depending on the quantity, mixer device, mixing temperature and application, the mixing time is, under a vacuum of 1 to 8 mbar, 0.25 to 1 h.

The premixed components are packaged according to their mixing ratio. To minimize any filler sedimentation, it's recommendable to empty the container completely. Before partial use, the contents must be carefully homogenized at elevated temperature. We recommend also the same preheating temperature to prevent air entrapment.

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In automatic feeding and mixing installations, both components are degassed and homogenized under a vacuum of about 2 - 5 mbar in separate holding tanks. From time to time the prefilled products are agitated to avoid any sedimentation and irregular metering. After dosing and mixing with a static mixer, the system is fed directly to the vacuum casting chamber or, in case of the automatic pressure gelation process, directly to the hot casting mold. Several individual casting stations can be fed via separate feeding tubes.

The effective pot-life of the mixed system is about 1 to 2 days at temperatures below 25°C (77ºF). Conventional batch mixers should be cleaned once a week or at the end of work. For longer interruptions of work, the pipes of the mixing and metering installations must be cooled and cleaned with the resin component to prevent sedimentation and/or undesired viscosity increase. Interruptions over a weekend without cleaning are possible if the pipes are cooled at temperatures below 18°C (64ºF). For information regarding viscosity increase and gel time at various temperatures, refer to Figures.1 and 3.

Mold temperature

APG process	130 - 160°C (266 – 320ºF)
Conventional vacuum casting	80 - 100°C (176 – 212ºF)

Demolding times (depending on mold temperature and casting volume)

APG process	10 - 40 minutes
Conventional vacuum casting	4 – 8 hours

Cure conditions (minimal postcure)

APG process	2 hours at 150°C (302ºF) OR 5 hours at 140°C (284ºF)
Conventional vacuum casting	2 hours at 150°C (302ºF) OR 5 hours at 140°C (284ºF)

To determine whether cross-linking has been carried to completion and the final properties are optimal, it is necessary to carry out relevant measurements on the actual object or to measure the glass transition temperature. Different gel and post-curing cycles in the manufacturing process could influence the cross-linking and the glass transition temperature respectively.

Mix ratios

	Parts by weight
Araldite® CW 5908	100
Aradur® HW 5909	100

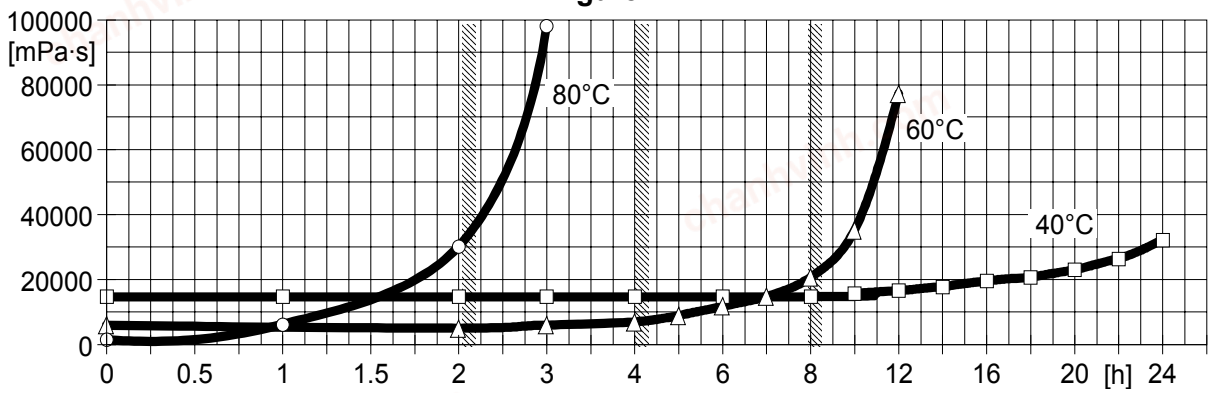
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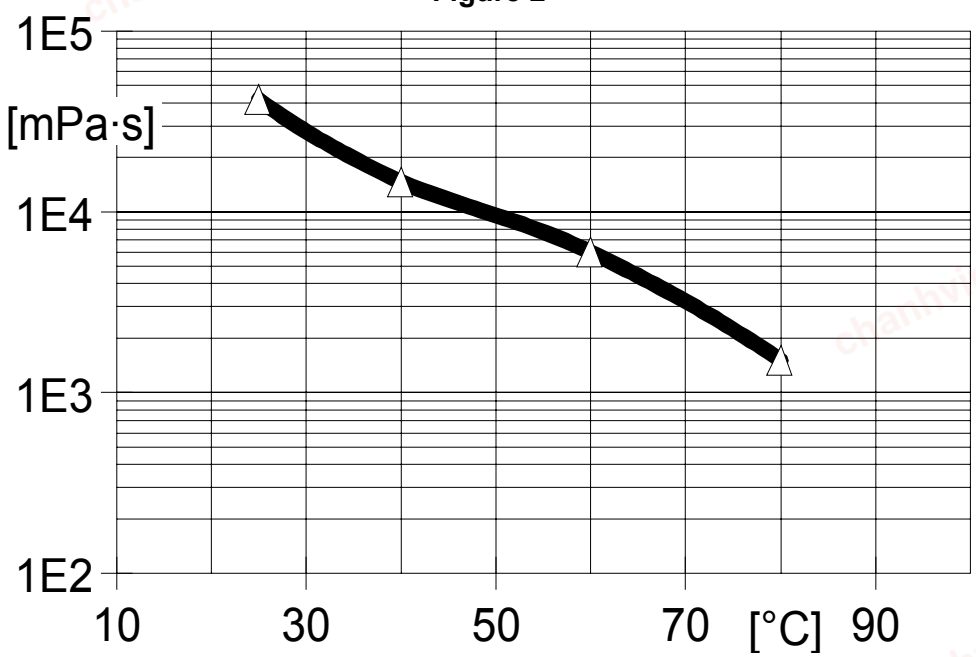
Reactivity Characteristics:

Figure 1



Viscosity increase at 40, 60 and 80°C (measurements with Rheomat 115) (Shear rate D = 10 s^{-1})

Figure 2



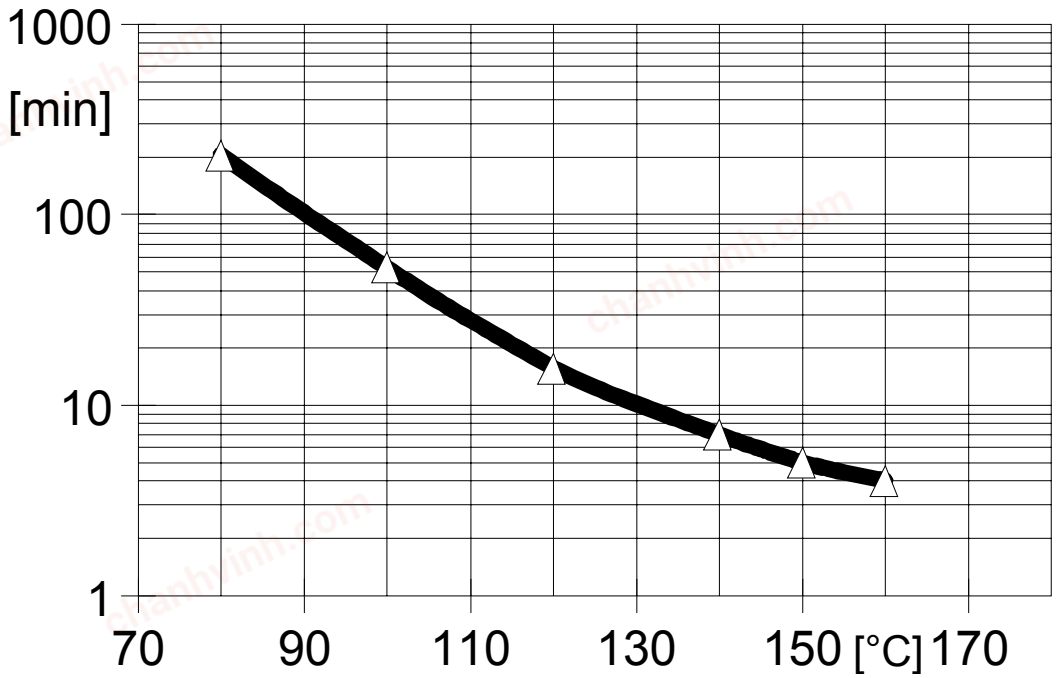
Initial viscosity as a function of temperature

(measurements with Rheomat 115, D = 10 s^{-1})

Typical Cured Properties

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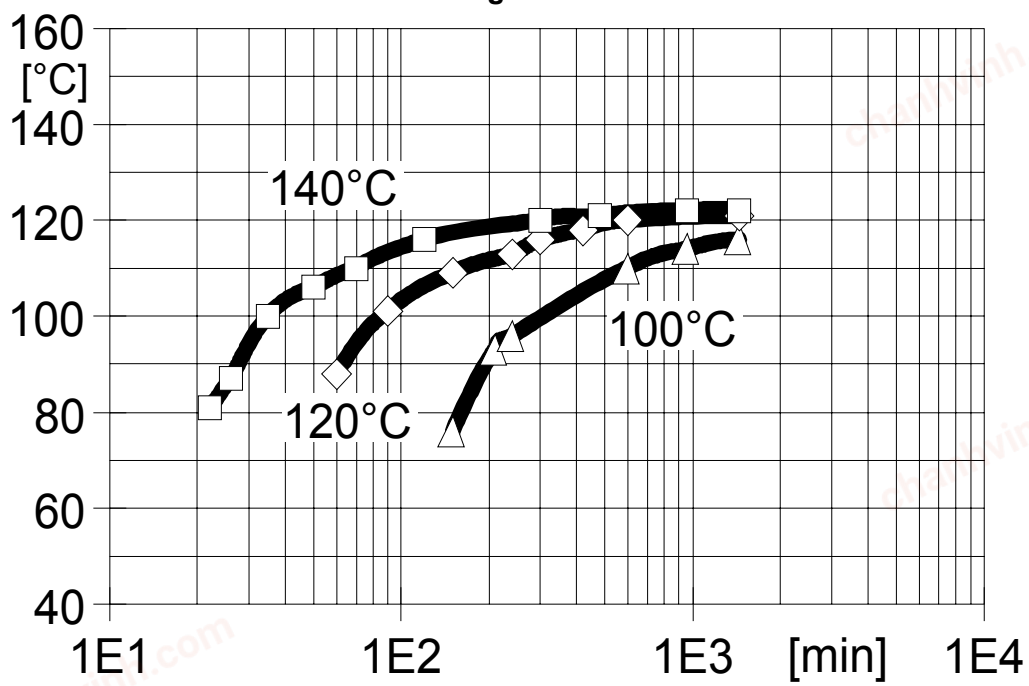
Figure 3



Gel time measured as a function of temperature

(measurements with Gelnorm Instrument / DIN 16945/ 6.3.1)

Figure 4



Glass transition temperature as a function of cure time

(isothermic reaction, IEC 1006)

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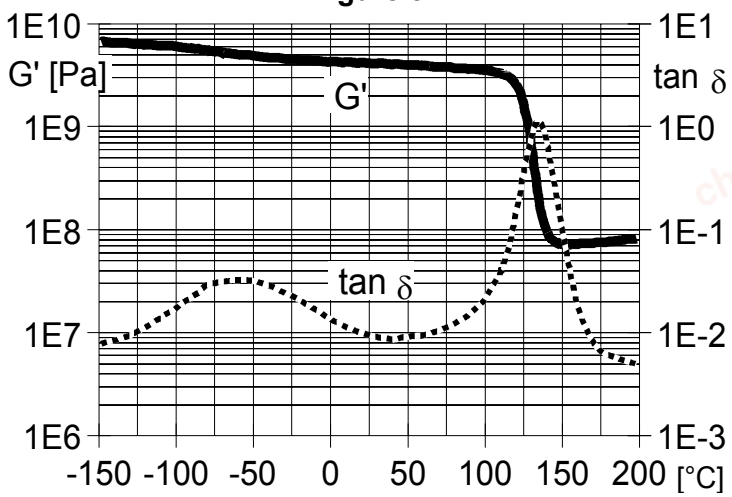
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Mechanical and Physical Properties (typical values)

Property	Test Value
Tensile strength. psi	10,500 – 12,000
Elongation at break, %	1.50 - 1.70
E modulus from tensile test, psi	1.40 - 1.48 x 10^6
Flexural strength, psi	17,000 – 20,000
Surface strain, %	1.8 - 2.0
E modulus from flexural test, psi	1.45 - 1.50 x 10^6
Double Torsion Test	
Critical stress intensity factor (K_{IC}), MPa·$m^{½}$	2.3
Specific energy at break (G_{IC}), J/m^2	500
Glass transition temperature DSC, °C (ºF)	115 – 132 (239 – 270)
Coefficient of linear thermal expansion	See Figure 6
Mean value for temperature range: 20-100°C, $°C^{-1}$	30 - 35·10^{-6}
Thermal conductivity, W/mK	0.75 - 0.85
Flammability	
Thickness of specimen: 4 mm	Class HB
Thickness of specimen: 12 mm	Class V-0
Water absorption (specimen: 50×50×4 mm)	
10 days at 23°C (75ºF), % by wt	0.20 - 0.24
in boiling water at 100°C, % by st	See Figure 7
Specific Gravity	1.80

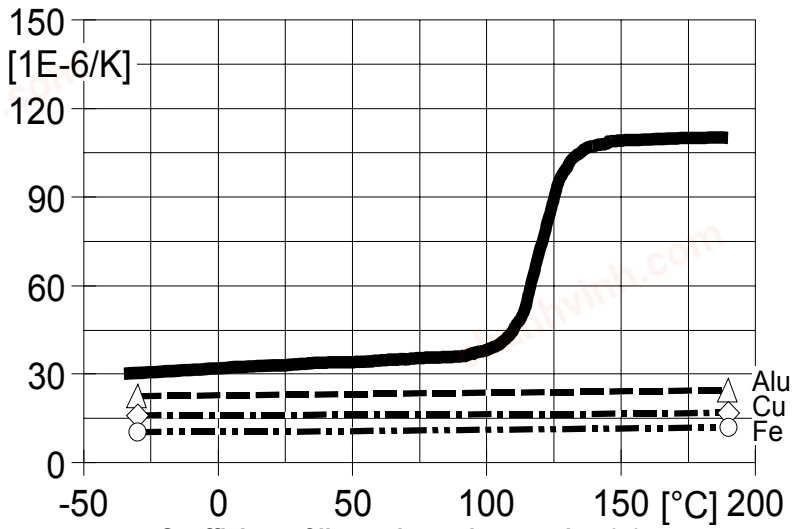
Figure 5



Shear modulus (G') and mechanical loss factor (tan □) as a function of temperature
(ISO 6721/ DIN 53445,methode C, measured at 1Hz)

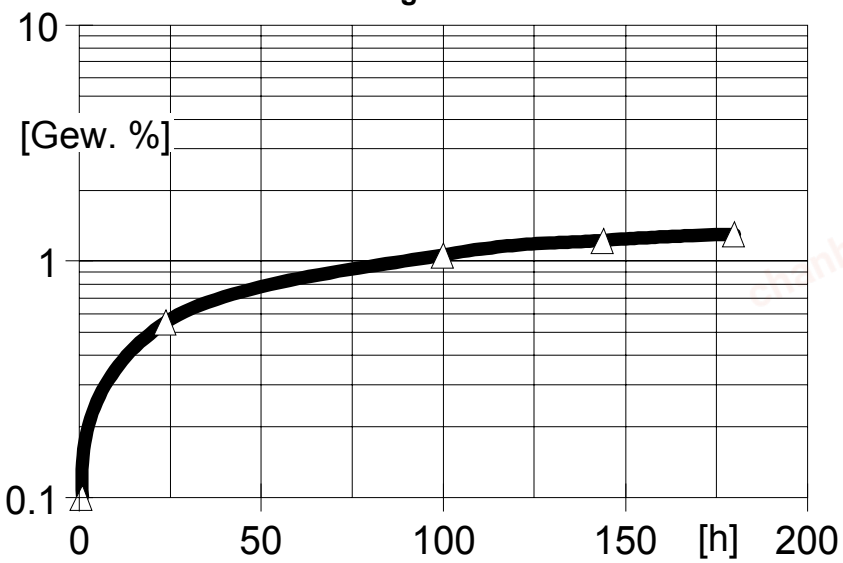
Figure 6

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Coefficient of linear thermal expansion (□)
as a function of temperature
(DIN 53752 / reference temperature: 23°C)

Figure 7



Water absorption at 100°C as a function of time
(specimen: 50×50×4 mm, DIN 53495/1L)

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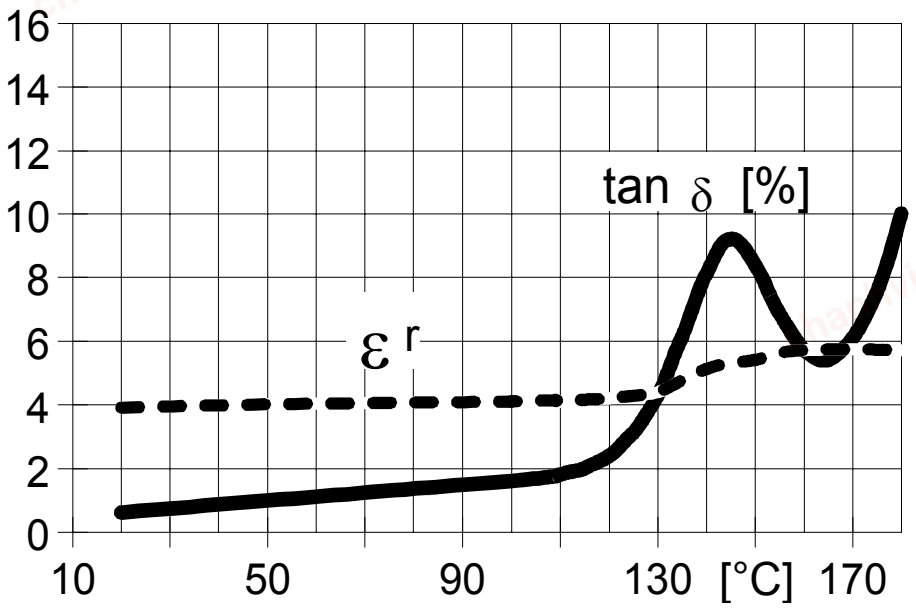
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Electrical Properties (typical values)

Determined on standard test specimen at 23°C (75ºF)
Cured for 2h at 100°C (212ºF) + 10h at 140°C (284ºF)

Breakdown strength	
(Test specimen with encapsulated	
Rogowski electrodes, gap: 1 mm, kV/mm)	35 - 38
HV arc resistance, sec.	195 – 210
Inclined Plane Tracking and Erosion Test	
Initial Tracking Voltage (i.t.v.), kV/min	3.5/50
Time to Track	
@ 2.5 kv. (t.t.t.), min.	> 2,000
@ 3.5 kv. (t.t.t.), min.	> 300

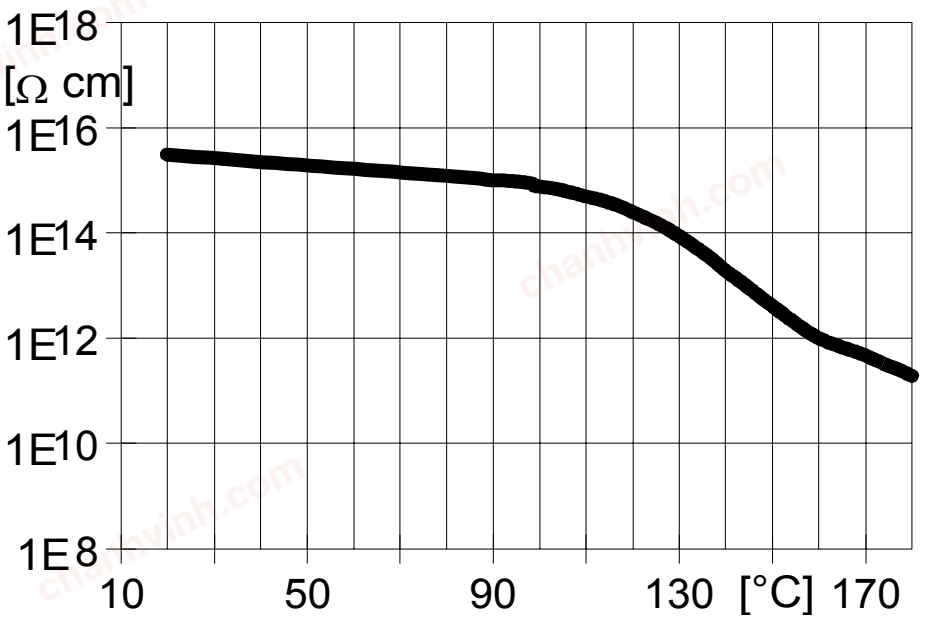
Figure 8



Loss factor (tan δ) and dielectric constant (εr) as a function of temperature
(measurement frequency: 50 Hz / IEC 250/ DIN 53483)

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Figure 9



Volume resistivity (ρ) as a function of temperature
(measurement voltage: 1000 V/ IEC 93/ DIN 53482)

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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 material safety data sheets.

Araldite® CW 5908 Resin
Warning! Causes skin and eye irritation. May cause allergic skin reaction. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated contact with skin. Do not breathe dust. Wash thoroughly after handling. Notice! Contains crystalline silica. Breathing dust may cause cancer and delayed lung injury.

Aradur® HW 5909 Hardener
Warning! Causes eye, skin, and respiratory irritation. May cause allergic skin and respiratory reactions. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor or mist. Avoid prolonged or repeated contact with skin. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. Notice! Contains crystalline silica. Breathing dust may cause cancer and delayed lung injury.

Caution:

Huntsman Advanced Materials Americas Inc. maintains up–to-date Material Safety Data Sheets (MSDS) on all of its products. These sheets contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Users should review the latest MSDS to determine possible health hazards and appropriate precautions to implement prior to using this material. Copies of the latest MSDS may be requested by calling our customer service group at 888-564-9318 or emailing your request to electronics@huntsman.com.

FIRST AID!

Eyes and skin: Flush eyes with water for 15 minutes. Contact a physician if irritation persists. Wash skin thoroughly with soap and water. Remove and wash contaminated clothing before reuse.
Inhalation: Remove subject to fresh air.
Swallowing: Dilute by giving water to drink and contact a physician promptly. Never give anything to drink to an unconscious person.

KEEP OUT OF REACH OF CHILDREN

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