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**Advanced Materials**
**Technical Datasheet**

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# Araldite® CW 229 US Resin / Aradur® HW 229-1 US Hardener

## Product Description

Araldite® CW 229 US Resin with Aradur® HW 229-1 US Hardener is a liquid, heat curing two-component epoxy casting systems containing mechanically reinforcing fillers. This system is readily processed into a resilient polymer having excellent mechanical and electrical characteristics. The cured product exhibits exceptional resistance to thermal cycling as well as thermal endurance properties, which qualifies for 200°C applications. This system is recommended for the manufacture of electrically insulating components and for use as electrical insulation for indoor medium and high voltage applications including SF6 insulated types

## Features

- Components are easily processed liquids
- Rapid gelation at mold temperatures of 140°C and above
- Excellent mechanical and electrical properties
- Excellent fracture toughness characteristics
- Excellent performance in applications requiring thermal cycling
- Recognized insulation component with Thermal Index of 200°C

## Typical Properties*

| Property | Araldite® CW 229 US Resin | Aradur® HW 229-1 US Hardener |
|---|---|---|
| Appearance | Beige Viscous Liquid | Beige Viscous Liquid |
| Density, g/cm$^3$ | 1.76 - 1.83 | 1.90 - 1.98 |
| Viscosity @ 25ºC, cP | 80,000 - 200,000 | 25,000 - 75,000 |
| Flash point, Closed Cup, °C | 135 | 140 |

*Properties are based on Huntsman test methods. Copies are available upon request

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## Processing

Araldite® CW 229 US Resin and Aradur® HW 229-1 US Hardener system is ideally suited for processing by conventional techniques. The optimum gelation and cure schedule in this case is dependent on the design of the part. When casting very large parts with this system, an extended cure cycle is recommended to reduce formulation of high stress areas within the cured part. General processing conditions are given below:

**Smaller parts:**
For relatively thin, low mass castings, a simplified cure schedule would be: within preheated mold at 80ºC - 100°C, mix materials at 40ºC - 80°C. Fill mold, then gel typically for 4 - 6 hours at 80°C or 2 hours at 100°C. Then post cure either 2 hours at 140°C, or 10 hours at 130°C.

**Very large parts:**
Within preheated mold and mixed materials at 60ºC - 80°C, cure with either a step or ramp cure cycle. For example, ramp cure from initial mold temperature to 140°C in linear ramp over a time of 16 - 24 hours. Then post cure for an additional 4 - 6 hours at 140°C. Cool slowly to 100°C or less over a period of several hours prior to de-molding.

**APG Casting:**
This system is ideally suited to processing by the Automatic Pressure Gelation (APG) technique. However, it can be used to produce small sized castings by conventional means as above. In using the APG process, preheat mold to 140ºC - 160°C. Fill the mold in 2 - 5 minutes with the mixed material at 50°C to 60°C. Gel within mold under pressure of 1 - 3 atm for 7 - 15 minutes (dependent on part size and mixed material temperature). Then post cure for either 2 hours at 150°C, 4 - 6 hours at 140°C, or 10 hours at 130°C.

**Mixing Ratio**

| Product | Parts by weight | Parts by Volume |
|---|---|---|
| Araldite® CW 229 US Resin | 100 | 100 |
| Aradur® HW 229-1 US Hardener | 100 | 90 |

**Processing Data**

| Mixed Properties | Value |
|---|---|
| Viscosity, cP | |
| @ 25°C | 35,000 - 65,000 |
| @ 50°C | 2,500 - 3,500 |
| @ 70°C | 700 - 1,200 |
| Density, g/cm$^3$ | 1.80 - 1.85 |
| Gel time, 10g sample, min | |
| @ 130°C | 13 -15 |
| @ 150°C | 8 - 9 |

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## 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 | Test Method | Value |
|---|---|---|
| Tensile strength, psi | ASTM D638 | 11,000-12,500 |
| Elongation at break, % | ASTM D638 | 0.80 - 1.20 |
| Tensile modulus, psi | ASTM D638 | 1.50 - 1.55 x $10^6$ |
| Flexural strength, psi | ASTM D790 | 18,000 - 19,000 |
| Flexural modulus, psi | ASTM D790 | 1.40 - 1.50 x $10^6$ |
| Hardness | Shore D | 92 - 96 |
| Glass transition temperature, °C | DSC | 110 - 120 |
| Coefficient of thermal expansion, ppm/°C | TMA | See Figure 1 |
| Water absorption, 24 hours @ 23°C, | ASTM D 570 | 0.020 - 0.025 |
| Thermal conductivity, W/m·K | ISO 8894-2/90 | 0.7 - 0.8 |
| Density, g/$cm^3$ | ASTM D792 | 1.81 - 1.85 |
| Thermal endurance | UL 746B | See Figures 5 & 6 |
| Double Torsion Test<br>Critical stress intensity factor ($K_{1C}$), MPa·m½<br>Specific energy at break ($G_{1C}$), J/m² (calculated) | -- | <br>2.8 - 3.0<br>740 - 790 |

## Typical Electrical Properties

| Property | Test Method | Value |
|---|---|---|
| Dielectric strength, V/mil at 3 mm | IEC 60243 | 420 - 480 |
| Dielectric constant, @ 60 Hz | IEC 60250 | See Figure 2 |
| Dissipation factor, @ 60 Hz | IEC 60250 | See Figure 3 |
| Volume resistivity, ohm-cm | IEC 60093 | See Figure 4 |
| Thermal endurance | IEC 216 | See Figures 5 & 6 |

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**Figure 1. Coefficient of Thermal Expansion as a function of temperature**

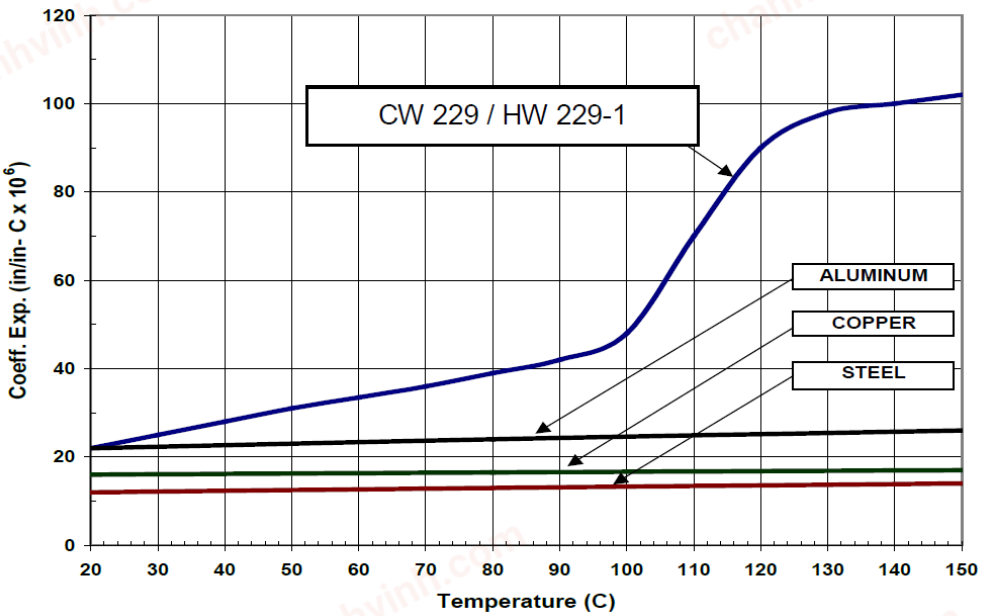


**Figure 2. Dielectric constant vs. temperature @ 60 Hz**

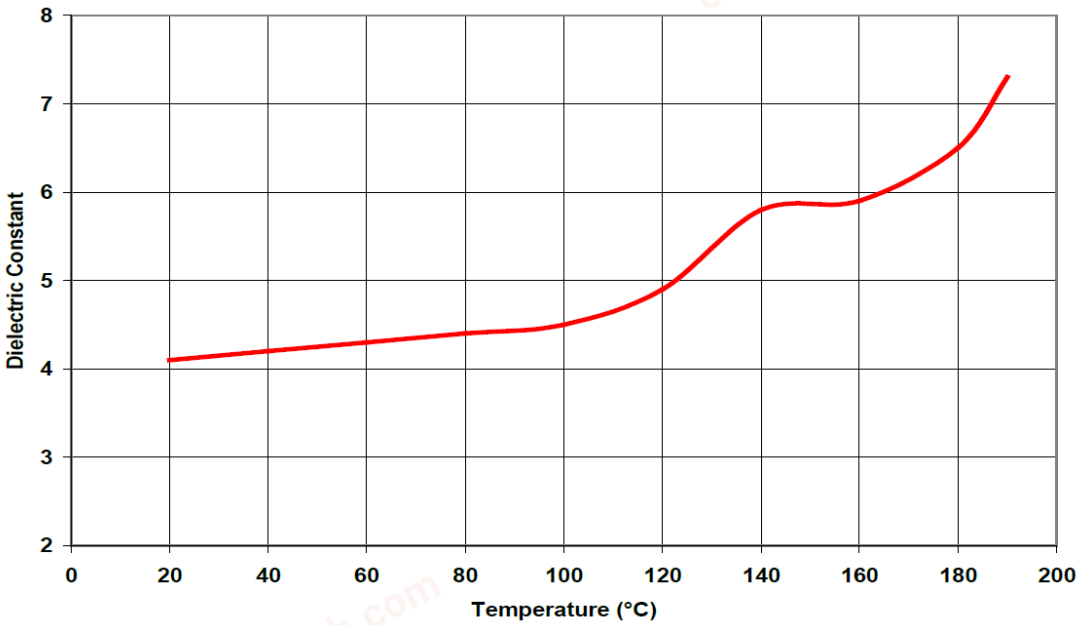

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**Figure 3. Dissipation factor vs. temperature @ 60 Hz**

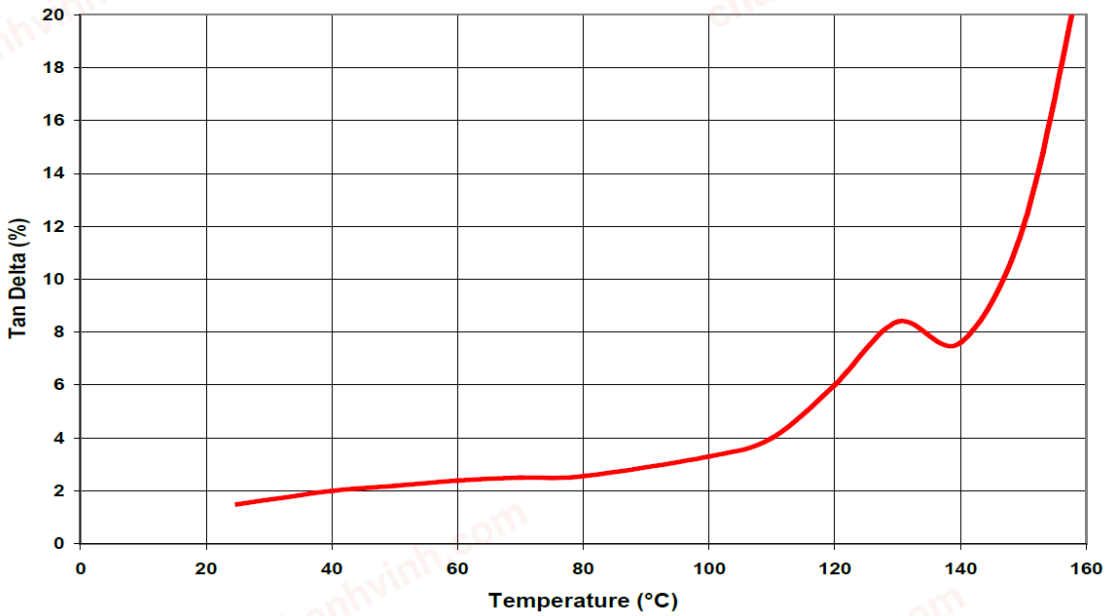


**Figure 4. Volume resistivity vs. temperature**

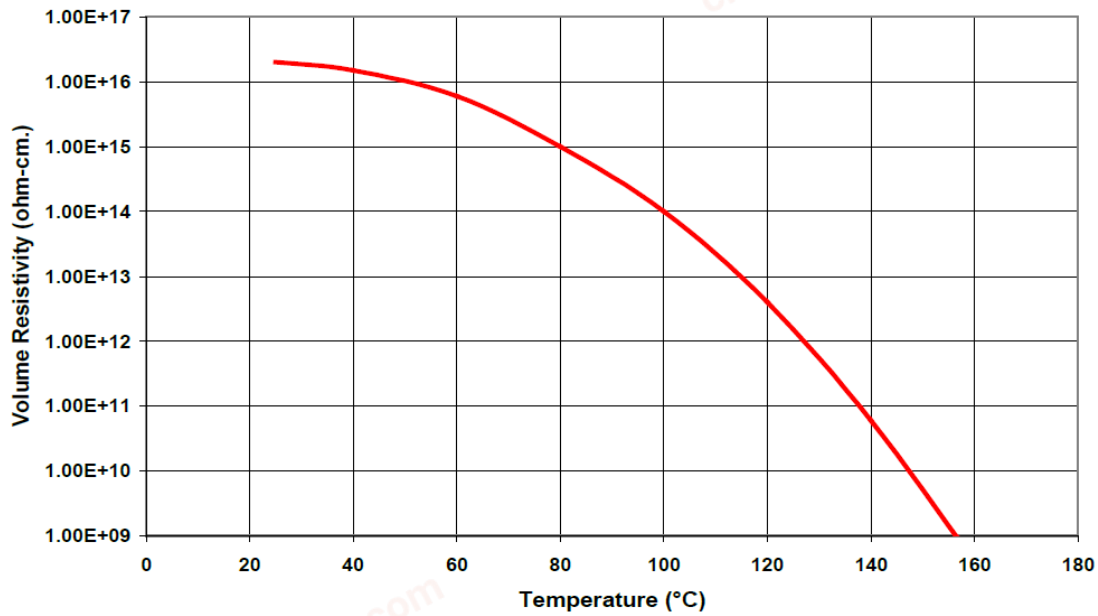

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**Figure 5. Thermal endurance**

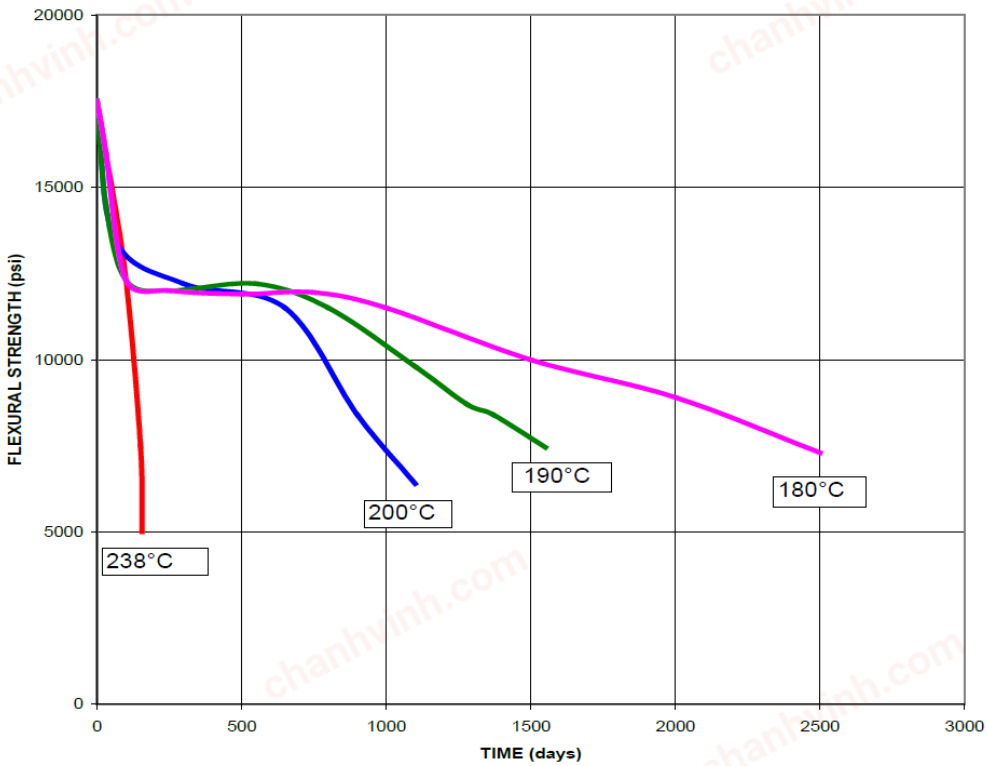
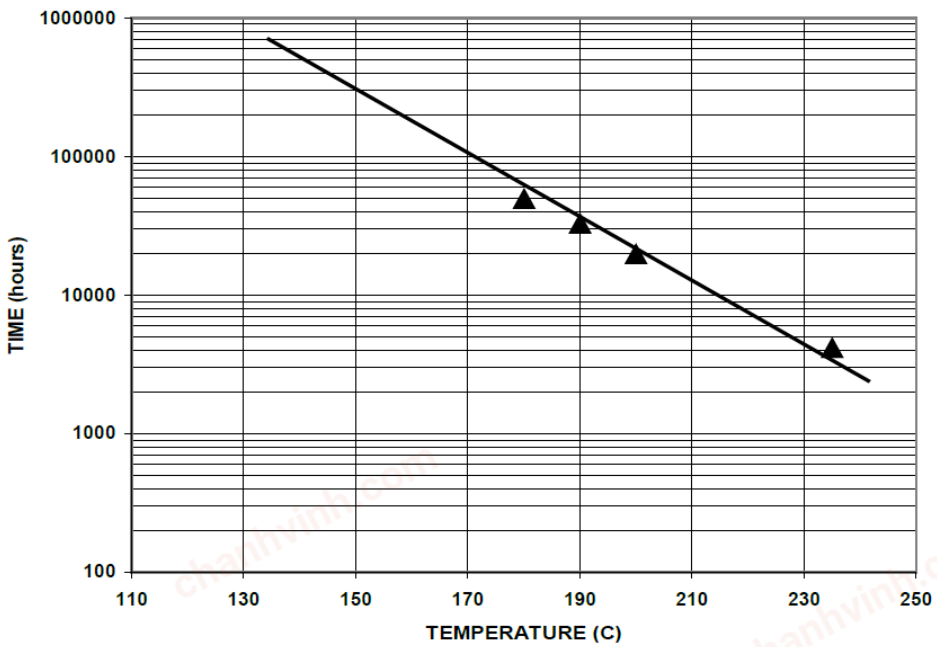



**Figure 6 Thermal endurance - 50% Flexural strength**



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## Storage

**Araldite® CW 229 US Resin** contains some curing catalyst and / or accelerator. It should preferably not be stored for long periods at temperatures exceeding 30°C nor should it be exposed to temperatures in excess of 100°C for more than 2 hours. Incorrect handling will result in an increase in viscosity and reduced performance properties of the cured system.

**Aradur® HW 229-1 US Hardener** contains some curing catalysts and / or accelerators. Storage at elevated temperatures (>80°C) for extended periods (e.g. >5 days) will result in an undesirable increase in viscosity and impaired reactivity of the mixed system. This hardener is sensitive to moisture. Partially used containers should be closed immediately after use. Nitrogen blanketing is highly recommended as well as the use of a desiccant venting device unless the material is going to be used rapidly after opening.

**Araldite® CW 229 US Resin** and **Aradur® HW 229-1 US Hardener** 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 **1 year** (from date of manufacture). The product should not be exposed to direct sunlight. As with most pre-filled systems, the fillers present in these components have a tendency to separate during storage. This filler separation will not negatively affect the final product properties and quality provided that both components are thoroughly homogenized. The filled components should be stirred carefully by using a low shear mixer prior to processing. Do not use high speed or high shear mixers and take precautions to prevent air entrapment.

## Precautionary Statement

Huntsman Advanced Materials Americas LLC maintains up-to-date Safety Data Sheets (SDS) 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.

**First Aid!**
Refer to SDS as mentioned above.

**KEEP OUT OF REACH OF CHILDREN**

**FOR PROFESSIONAL AND INDUSTRIAL USE ONLY**

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**Main Offices:**

**Huntsman Corporation**
10003 Woodloch Forest Dr
The Woodlands, TX 77380
888-564-9318

**Huntsman Advanced Technology Center**
8600 Gosling Rd.
The Woodlands, TX 77381
281-719-7400