

Advanced Materials**Araldite® MT 35700 #**

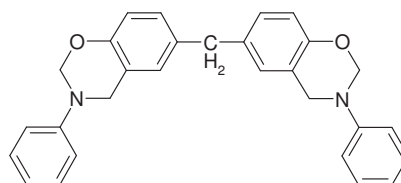
Benzoxazine Resin

DATA SHEET**Bisphenol-F based Benzoxazine****Key properties**

- Good flammability resistance UL94 V1
- Excellent chemical resistance
- Low water absorption
- Dimensional stability
- High modulus properties

Description

Araldite® MT 35700 is a bisphenol-F based benzoxazine thermoset resin which can be homopolymerized or co-react with an epoxy or phenol resin resulting in polymers with extremely good thermal and mechanical properties.

Chemical Structure**Processing**

Pultrusion, Pre-preg, Pressure Molding, Resin Transfer Molding (RTM)

Applications

Advanced composites, Structural adhesives, Laminates for printed wiring boards, Encapsulates, High performance coatings, Molding compounds.

In addition to the brand name product denomination may show different appendices, which allows us to differentiate between our production sites: e.g. BD = Germany, US = United States, IN = India, CI = China, etc. These appendices are in use on packaging, transport and invoicing documents. Generally the same specifications apply for all versions. Please address any additional need for clarification to the appropriate Huntsman contact.

Key data

Specified key data

| | | |
|----------------------------------------------|-----------------|---------|
| Aspect (visual) | Yellowish solid | |
| Viscosity rotary , 100 °C (ISO 3219) | 1 000 – 7 000 | [mPa.s] |
| Gel time , 220 °C (ISO 8130-6) | 200 – 450 | [sec.] |
| Softening point , Mettler (DIN 51920) | 60 - 80 | [°C] |

Specified key data are individually checked throughout and guaranteed.

Typical key data

| | | |
|-----------------------------------------------------------|------|------|
| Flash point (Pensky Martens, closed cup, ISO 2719) | >100 | [°C] |
|-----------------------------------------------------------|------|------|

Typical key data are spot checked; the values are typical for the product and are indicated for information only. The values are not guaranteed.

Typical Cured Properties

Unless otherwise stated, the data were determined with typical production batches using standard testing methods. They are provided solely as technical information and do not constitute a product specification.

Mechanical Properties

Cure schedule: 3h at 170°C + 2h at 180°C + 4h at 200°C

| | |
|-----------------------------|-------|
| Flexural test ¹ | |
| Flexural Modulus, MPa | 5,590 |
| Flexural Strength, MPa | 127 |
| Tensile test ² | |
| Tensile Modulus, MPa | 6,763 |
| Tensile Strength, MPa | 69 |
| Toughness test ³ | |
| K1c, MPa√m | 0.66 |
| G1c, J/m ² | 80.2 |

Thermal Properties

Cure schedule: 3h at 170°C + 2h at 180°C + 4h at 200°C

| | |
|--------------------------------------|-----------|
| Glass transition (Tg) | |
| DSC ⁴ , °C | 145 – 155 |
| DMA ⁵ , °C | 160 – 170 |
| Weight loss ⁶ @ 350 °C, % | 6.99 |

Flammability Properties⁷

| | |
|-----------------------|---------|
| Total burn time, sec. | 75 – 95 |
| Rating | V1 |

¹ ISO 178/01

² ISO 527T2/93

³ Bend Notch test ISO 13586/03

⁴ DSC: TA Q2000 / ramp @ 10 °C / 30 °C – 300 °C / nitrogen

⁵ DMA: TA Q800 / ramp @ 10 °C / 30 °C – 300 °C / nitrogen

⁶ TGA: TA 2950 / ramp @ 10 °C / 30 °C – 800 °C / air

⁷ UL94 Vertical burn test

Cast Procedure

Weigh benzoxazine material in an appropriate kettle equipped with heating capability, mechanical stirrer and temperature recording device. Heat with continuous stirring to 120-140°C until a clear homogeneous solution is obtained. Additional heating dictates the pot life of the resultant prepolymer. For clear casting, degas the resultant mixture, while maintained at 120°C - 140°C, at 26+ inches of vacuum for 15 minutes; or until foaming has stopped. This indicates that the product has been purged of any volatiles. Hot degassed melt can be poured into preheated molds; and cured at the desired conditions.

Formulations

Araldite® MT 35700 can be homopolymerized or formulate with epoxy resins, catalysts and toughener agents to improve performance. While formulating the Benzoxazine must be melted below their onset temperature of reaction by 30°C. Degassing time of the components in a vacuum oven should not exceed 50% of the gel time at temperature at least 30°C below the onset temperature of reaction. Once degassed cured as recommended cure schedule.

Formulations with epoxy resins

| Formulation No. | 1 | 2 | 3 |
|---------------------------------------------|-------|-------|-------|
| Araldite® MT 35700 Benzoxazine Resin | 75 | 75 | 75 |
| Araldite® CY 179 Epoxy Resin ⁹ | 25 | | |
| Araldite® MY 0500 Epoxy Resin ¹⁰ | | 25 | |
| Araldite® GY 260 Epoxy Resin ¹¹ | | | 25 |
| Gel time at 200°C, min. | 17 | 25 | 23 |
| Mechanical Properties | | | |
| Cure schedule: 2h at 180°C + 2h at 200°C | | | |
| Flexural test ¹ | | | |
| Flexural Modulus, MPa | 4,422 | 4,493 | 4,397 |
| Flexural Strength, MPa | 110 | 96 | 106 |
| Ultimate Elongation | 2.3 | 1.9 | 2.2 |
| Tensile test ² | | | |
| Tensile Modulus, MPa | 4,648 | 4,964 | 4,836 |
| Tensile Strength, MPa | 33 | 24 | 41 |
| Ultimate Elongation, % | 0.7 | 0.5 | 0.9 |
| Toughness test ³ | | | |
| K1c, MPa√m | 0.63 | 0.57 | 0.63 |
| G1c, J/m ² | 75 | 60 | 76 |
| Thermal Properties | | | |
| Cure schedule: 2h at 180°C + 2h at 200°C | | | |
| Tg DSC ⁴ , °C | 201 | 188 | 152 |
| DMA ⁵ | | | |
| Storage Modulus, °C | 187 | 165 | 149 |
| Loss Modulus, °C | 213 | 193 | 173 |
| Tangent Delta, °C | 230 | 212 | 192 |
| Weight loss ⁶ @ 350°C, % | 0.75 | 2.67 | 1.72 |

⁹ Liquid cycloaliphatic epoxy resin (epoxy equivalent weight: 131 – 143)

¹⁰ Low viscosity trifunctional liquid epoxy resin (epoxy equivalent weight: 105 -115)

¹¹ Standard bisphenol-A liquid epoxy resin (epoxy equivalent weight: 182 - 192)

| | |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage | Araldite® MT35700 benzoxazine resin should be stored in a dry place, preferably in the sealed original container, at temperatures between 2 and 40 °C. The product should not be stored exposed to direct sunlight. |
| Handling 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. |
| Note | Araldite® is a registered trademark of Huntsman LLC or an affiliate thereof. |

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