

Advanced Materials**Araldite[®] LY 3031 / Aradur[®] 3032****WARM CURING EPOXY SYSTEM**

Araldite[®] LY 3031 is an epoxy resin
Aradur[®] 3032 is an amine hardener

| | | | |
|---------------------|-------------------------------------------|--------------------------|----------------------|
| APPLICATIONS | Mass production of Automotive composites | | |
| PROPERTIES | Very fast cure system for composite parts | | |
| PROCESSING | • Wet Compression Moulding | | |
| PRODUCT DATA | Araldite[®] LY 3031 | | |
| | Aspect (visual) | clear liquid | |
| | Viscosity at 25 °C (ISO 12058-1) | 10000 – 12000 ** | [mPa.s] |
| | Density at 25 °C (ISO 1675) | 1.15 – 1.20 | [g/cm ³] |
| | Epoxy index (ISO 3001) | 5.30 – 5.50** | [Eq/kg] |
| | Aradur[®] 3032 | | |
| | Aspect (visual) | clear to slightly yellow | |
| | Viscosity at 25 °C (ISO 12058-1) | 20 – 40 | [mPa.s] |
| | Density at 25 °C (ISO 1675) | 0.94 – 1.0 | [g/cm ³] |
| | Amine value (ISO 9702) | TBD | [mgX/g] |

** Specified data are on a regular basis analysed. Data which is described in this document as 'typical' is not analysed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.

STORAGE Provided that Araldite[®] LY 3031 or Aradur[®] 3032 are stored in a dry place in their original, properly closed containers at the storage temperatures mentioned in the MSDS they will have the shelf lives indicated on the labels. Partly emptied containers should be closed immediately after use.

TYPICAL SYSTEM DATA**PROCESSING DATA**

| MIX RATIO | <i>Components</i> | <i>Parts by weight</i> | <i>Parts by volume</i> |
|------------------|-------------------|------------------------|------------------------|
| | Araldite® LY 3031 | 100 | 100 |
| | Aradur® 3032 | 21 | 25 |

We recommend that the components are weighed with an accurate balance to prevent mixing inaccuracies which can affect the properties of the matrix system. The components should be mixed thoroughly to ensure homogeneity. It is important that the side and the bottom of the vessel are incorporated into the mixing process.

When processing large quantities of mixture the pot life will decrease due to exothermic reaction. It is advisable to divide large mixes into several smaller containers.

Internal release agent with an amount of 0.5 – 2% is typically added to the system. It can either be mixed in as a 3rd component or premixed into the Araldite® LY 3031. The added amount depends on internal release agent type and part demolding behavior. Internal release agent used in this TDS is PAT 656/3 from E. und P. Würtz GmbH & Co (Industriegebiet Sponsheim; In der Weide 13 + 18; 55411 Bingen am Rhein). Refer to respective Würtz TDS for processing & handling details.

| | <i>Components</i> | <i>Parts by weight</i> | <i>Parts by volume</i> |
|--|-------------------|------------------------|------------------------|
| | Araldite® LY 3031 | 100 | 100 |
| | Aradur® 3032 | 21 | 25 |
| | PAT 656/3 | 0.5 – 1.5 | 0.5 – 1.5 |

| POT LIFE (TECAM 100G, 65%RH) | <i>[°C]</i> | <i>[min]</i> |
|-------------------------------------------|-------------|--------------|
| | at 23 | 15 - 25 |

| GEL TIME (HOT PLATE) | <i>[°C]</i> | <i>[sec]</i> |
|--------------------------------|-------------|--------------|
| | at 120 | 22 - 26 |
| | at 130 | 16 - 20 |
| | at 140 | 14 - 16 |
| | at 150 | 10 - 12 |

The values shown are for small amounts of pure resin/hardener mix. In composite structures the gel time can differ significantly from the given values depending on the fibre content and the laminate thickness.

| NITIAL MIX VISCOSITY (CONE-PLATE VISCOSIMETER) | <i>[°C]</i> | <i>[mPa.s]</i> |
|-----------------------------------------------------------------|-------------|----------------|
| | at 25 | 1600 - 2000 |
| | at 150 | < 10 |

PROPERTIES OF THE CURED, NEAT FORMULATION

Sample thickness 2 mm
 5 min cure at 100°C
 Above conditions have been used to generate meaningful data and avoid exotherm during coupons production

| Components | Parts by weight | Parts by volume |
|-------------------|-----------------|-----------------|
| Araldite® LY 3031 | 100 | 100 |
| Aradur® 3032 | 21 | 25 |
| PAT 656/3 | 1.5 | 1.5 |

TENSILE TEST

| (ISO 527-2) | | | |
|-------------|---------------------|-------|-------------|
| | Tensile modulus | [MPa] | 2650 – 2850 |
| | Tensile strength | [MPa] | 70 – 80 |
| | Ultimate elongation | [%] | 5.0 – 7.0 |

FRACTURE PROPERTIES BEND NOTCH TEST (ISO 13586)

| | | |
|-----------------------------|---------------------|-----------|
| Fracture toughness K_{1C} | [MPa√m] | 1.0 – 1.1 |
| Fracture energy G_{1C} | [J/m ²] | 320 – 380 |

WATER ABSORPTION (ISO 62)

| | | |
|-------------------------|-----|-------------|
| After 168 hours at 23°C | [%] | 0.70 – 0.75 |
|-------------------------|-----|-------------|

PROPERTIES OF THE CURED, REINFORCED FORMULATION

Samples: 6 layers Carbon fabric UD (333g/m²); Panex PX35 UD300
 Laminate thickness: 2.0 – 2.2mm
 Fibre volume content: 47 – 53%

| | | | |
|-------------------------------------------------------------------|----------------|------|---------------|
| GLASS TRANSITION TEMPERATURE (ISO 11357-2, DSC, 5K/MIN) | Cure: | | 30 sec. 140°C |
| | T_g midpoint | [°C] | 110 – 120 |

| | | | |
|---------------------------------------------------------------------------|-------|------|---------------|
| GLASS TRANSITION TEMPERATURE (ISO 6721-4, DMA) 2K/MIN, G' onset | Cure: | | 30 sec. 140°C |
| | T_g | [°C] | 95 – 105 |

We recommend to specify and assess T_g on composites and not on neat resin. Indeed the exothermic behavior during neat resin coupons production is generating a significant temperature rise resulting in the resin curing to a much higher temperature and hence leading to higher T_g value compared to the final composite part.

| | | | |
|-----------------------------------------------------|----------------|-------|---------------|
| INTERLAMINAR SHEAR STRENGTH (ASTM D 2344) | Cure: | | 30 sec. 140°C |
| | Shear strength | [MPa] | 63 – 67 |

**HANDLING
PRECAUTIONS****Personal hygiene***Safety precautions at workplace*

| | |
|------------------------|--------------------------------------|
| protective clothing | yes |
| gloves | essential |
| arm protectors | recommended when skin contact likely |
| goggles/safety glasses | yes |

Skin protection

| | |
|----------------------|-------------------------------------|
| before starting work | Apply barrier cream to exposed skin |
| after washing | Apply barrier or nourishing cream |

Cleansing of contaminated skin

Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents

Disposal of spillage

Soak up with sawdust or cotton waste and deposit in plastic-lined bin

Ventilation

| | |
|---------------|--------------------------------------------------------|
| of workshop | Renew air 3 to 5 times an hour |
| of workplaces | Exhaust fans. Operatives should avoid inhaling vapours |

FIRST AID

Contamination of the eyes by resin, hardener or mix should be treated immediately by flushing with clean, running water for 10 to 15 minutes. A doctor should then be consulted.

Material smeared or splashed on the *skin* should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A doctor should be consulted in the event of severe irritation or burns. Contaminated clothing should be changed immediately.

Anyone taken ill after *inhaling* vapours should be moved out of doors immediately.

In all cases of doubt call for medical assistance.

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