

Advanced Materials

**HUNTSMAN**

Structural Composites

MATRIX SYSTEMS FOR INDUSTRIAL COMPOSITES

DATA SHEET

**Expanding epoxy resin systems based on  
Araldite<sup>®</sup> LY 5054\* / Foaming Agent DY 5054\* /  
Aradur<sup>®</sup> 5003-1\* / Aradur<sup>®</sup> 5172-1\***

**Araldite LY 5054 is a modified, solvent-free epoxy resin**  
**Foaming Agent DY 5054 is a chemical foaming agent**  
**Aradur 5003-1 is a polyamine-based hardener**  
**Aradur 5172-1**

These hardeners show different reactivities (increasing from top to bottom) and can each be processed with Araldite LY 5054.

**Applications**

- Structural components for the automobile industry
- Industrial components

**Properties**

The combination of resin with the different hardeners (reaction resin mixture = RRM) produces expanding epoxy resin systems which are suitable for the economic manufacture of rigid, very light, dimensionally stable components, from the prototype stage to series production.

All of the listed systems allow the production of sandwich components and monolithic laminates. Any chemical contraction is counterbalanced by the expansion. The expanding epoxy resin systems listed contain no halogenated hydrocarbons.

**Processing**

Compression moulding in heated press tools at temperatures > 50 °C.

**Processing principle**

During the reaction of the RRM, gas is generated. The expansion pressure produced in the closed, heated mould serves several purposes:

- to impregnate the fibrous materials laid in the mould;
- to compensate for the loss of volume of the epoxy resin system in the liquid phase;
- to mould components with different layer thicknesses exactly to the contours;
- to stick the core to the laminate in sandwich structures.

The production of sandwich components by this method has been patented by Ciba Specialty Chemicals: Europatent No. 69076.

**Key data****Key data****Araldite LY 5054**

Aspect (visual)		whitish, turbid liquid	
Viscosity at 20 °C	(ISO 2555)	20000 - 50000	[mPa s]
Density at 20 °C	(ISO 1675)	1.08 - 1.18	[g/cm <sup>3</sup> ]
Flash point	(ISO 2719)	> 150	[°C]

**Foaming Agent DY 5054**

Aspect (visual)		clear liquid	
Viscosity at 20 °C	(ISO 2555)	~ 35	[mPa s]
Density at 20 °C	(ISO 1675)	0.93 - 1.03	[g/cm <sup>3</sup> ]
Flash point	(ISO 2719)	> 100	[°C]

**Aradur 5003-1**

Aspect (visual)		clear, pale yellow liquid	
Viscosity at 20 °C	(ISO 2555)	160 - 250	[mPa s]
Density at 20 °C	(ISO 1675)	0.97 - 1.03	[g/cm <sup>3</sup> ]
Flash point	(ISO 2719)	ca. 174	[°C]

**Aradur 5172-1**

Aspect (visual)		clear, brownish liquid	
Colour (Gardner)	(ISO 4630)	7 - 10	
Viscosity at 20 °C	(ISO 2555)	7000 - 14000	[mPa s]
Density at 20 °C	(ISO 1675)	0.86 - 0.96	[g/cm <sup>3</sup> ]
Flash point	(ISO 2719)	> 100	[°C]

**Storage**

The products described in this data sheet should be stored in a dry place, well sealed in their original containers, at temperatures between 5 °C and 35 °C. Under these conditions the shelf life is as stated on the container label. The products should not be exposed to direct sunlight. Partially used containers should be resealed immediately after use.

Crystallized resin or hardener components can be regenerated by heating to 60 to 70 °C.

**Processing data**

<b>Mix ratios</b>	Araldite	LY 5054	LY 5054
	Aradur	5003-1	5172-1
	Foaming Agent	DY 5054	DY 5054
	<i>[Parts by weight]</i>	100	100
		20	40
		1 - 4	1 - 4
	<i>[Parts by volume]</i>	100	100
		23	50
		1.2 - 4.6	1.2 - 4.6
<b>Gel time</b> (Gelnorm, DIN 16945, ISO 9396)	Araldite	LY 5054	LY 5054
	Aradur	5003-1	5172-1
	Foaming Agent	DY 5054	DY 5054
	<i>[°C]</i>	<i>[min]</i>	<i>[min]</i>
	at 60	8.5 - 9.5	7 - 8
	at 80	4 - 5	3.5 - 4.5
	at 100	2 - 3	2 - 3
<b>Typical pressing times</b>	Araldite	LY 5054	LY 5054
	Aradur	5003-1	5172-1
	Foaming Agent	DY 5054	DY 5054
		<i>[°C] / [min]</i>	<i>[°C] / [min]</i>
		80 / 7.5	50 / 35
		100 / 3.5	80 / 7
		140 / 1	

The optimum curing/pressing times must be determined for each individual case. They are strongly dependent on the thickness of the component and the type of tools.

**Processing instructions**

The Foaming Agent DY 5054 must be mixed intensely into the resin Araldite LY 5054, preferably with a dissolver before processing.

Araldite LY 5054 must be homogenized before processing.

While a laboratory mixer is perfectly adequate for the production of prototypes, for series production we recommend the use of heatable low-pressure mix-metering systems with a dynamic or dynamic/static mixing head. It is advantageous to preheat the resin component to 40 - 50 °C.

We recommend weighing the components with an accurate balance, so as to avoid errors, which can considerably affect the properties of the matrix system. The components must be thoroughly stirred to achieve good homogeneity. Care should be taken that material adhering to the side or bottom of the container is also mixed in.

If substantial quantities of reaction resin mass are to be processed, the pot life (open time) decreases because of the exothermic reaction. The heat evolved may be considerable. It is therefore advisable to distribute large quantities of RRM among several containers.

**Properties of the cured, unreinforced, expanded material**

<b>Glass transition temperature (T<sub>G</sub>)</b>	Araldite	LY 5054	LY 5054
	Aradur	5003-1	5172-1
	Foaming Agent	DY 5054	DY 5054
(IEC 1006, DSC, 10 K/min)	T <sub>G</sub> max.	[°C]	[°C]
		125 - 127	90 - 95

**Recommendation** Remove the component from the mould after about 2-3 times the gel time. Curing is influenced by the wall thickness and the rate of heat loss.

<b>Mechanical properties</b>	Compressive strength	(DIN 53454)	[N/mm <sup>2</sup> ]	4.5 - 4.8
	Flexural strength	(ISO 178)	[N/mm <sup>2</sup> ]	4.8 - 5.1
	Elastic modulus	(ISO 178)	[N/mm <sup>2</sup> ]	210 - 260
All mechanical properties depend on the degree of expansion (density). The data quoted are typical values for a density of about 0.4 g/cm <sup>3</sup> .				

**Properties of the cured composite material**

<b>Mechanical properties</b>	<i>Glass fiber type</i>		<i>Cut-fiber mat</i>	<i>Continuous mat</i>	<i>Injectex cloth</i>
			450 g/m <sup>2</sup>	450 g/m <sup>2</sup>	450 g/m <sup>2</sup>
Fiber content		[Vol.-% ]	26	26	40
Elastic modulus	(ISO 527)	[N/mm <sup>2</sup> ]	6500	5100	17000
Impact strength	(ISO 179)	[kJ/m <sup>2</sup> ]	65	50	100
Flexural strength	(ISO 178)	[N/mm <sup>2</sup> ]	180	150	340
ILS	(ASTM D 2344)	[N/mm <sup>2</sup> ]	24	20	35

All mechanical properties depend on the type and quantity of reinforcing material and on the degree of expansion. The data quoted are therefore typical data only.

**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 and the brochure "Hygienic precautions for handling plastics products".

**Personal hygiene***Safety precautions at workplace*

protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
<u>goggles/safety glasses</u>	yes

*Skin protection*

before starting work	Apply barrier cream to exposed skin
<u>after washing</u>	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.

**Note**

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