

Advanced Materials**Resin XU 3508* / Aradur[®] 5021
Hardener XB 3403* / Hardener XB 3471 *****PREPREG SYSTEM FOR LOW TEMPERATURE CURE**

Resin XU 3508 (epoxy resin)
 Aradur[®] 5021 (hardener paste)
 Hardener XB 3403 (hardener based on polyamine)
 Hardener XB 3471 (hardener based on polyamine)

APPLICATIONS	Industrial composites		
PROPERTIES	Prepreg system with a long shelf life and curable from 80°C on		
PROCESSING	Prepregging		
KEY DATA	Resin XU 3508		
	Aspect (visual)	white liquid	
	Viscosity at 25 °C (ISO 2555)	11000 – 20'000	[mPa s]
	Density at 25 °C (ISO 1675)	1.15 - 1.20	[g/cm ³]
	Storage temperature	2 - 40	[°C]
	Aradur[®] 5021		
	Aspect (visual)	White viscous paste	
	Viscosity at 25 °C	70000 - 90000	[mPa s]
	Density at 25 °C (ISO 1675)	1.0	[g/cm ³]
	Storage temperature	< 8	[°C]
	Hardener XB 3403		
	Aspect (visual)	clear liquid	
	Viscosity at 25 °C	5 - 20	[mPa s]
	Density at 25 °C (ISO 1675)	1.0	[g/cm ³]
	Storage temperature (see expiry date on original container)	2 - 40	[°C]
	Hardener XB 3471		
	Aspect (visual)	transparent liquid	
	Density at 25 °C (ISO 1675)	1.0	[g/cm ³]
	Flash point (ISO 2719)	≥ 100	[°C]
	Storage temperature (see expiry date on original container)	2 - 40	[°C]
STORAGE	<p>Provided that the products described above are stored in a dry place in their original, properly closed containers at the above mentioned storage temperatures they will have the shelf lives indicated on the labels. Partly emptied containers should be closed immediately after use. Resin XU 3508 and hardener XB 3471 which have crystallized and look cloudy can be restored to their original state by heating to 60 - 80 °C.</p>		

* 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.

PROCESSING DATA

MIX RATIO	Components, parts by weight	System 1	System 2
	Resin XU 3508	100	100
	Aradur® 5021	22	22
	Hardener XB 3403	12	
	Hardener XB 3471		12

Mix the epoxy Resin XU 3508 with the hardener Aradur® 5021 and add the hardener XB 3403 or XB 3471 just before the prepregging process. The premix of the resin XU 3508 / hardener Aradur® 5021 has a long shelf life at RT (> 1 week)

The prepreg tackiness can be adjusted by the amount of the hardener XB 3403 or XB 3471

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.

INITIAL MIX VISCOSITY (CONE PLATE VISCOSIMETER)			System 1	System 2
	at 25°C	[mPas]	3600 - 4200	3600 - 4200

POT LIFE (TECAM, 100 ML, 65 % RH)	all the 3 components		System 1	System 2
		[min]	350 - 400	350 - 400

GEL TIME (HOT PLATE)			System 1	System 2
	90°C	[min]	60 - 105	60 - 105
	100°C	[min]	25 - 35	25 - 35
	110°C	[min]	20 - 26	20 - 26
	120°C	[min]	6 - 9	6 - 9

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.

PREPREG PRODUCTION	Impregnation bath temperature	25 - 30 °C
	B-Stage (pre-reaction)	24 h at 23 – 25°C

PREPREG SHELF LIFE		System 1	System 2
	at 23 °C	> 4 weeks	> 4 weeks

PROPERTIES OF THE CURED, NEAT FORMULATION

GLASS TRANSITION TEMPERATURE (TG)		<i>Cure: after B-Stage</i>		system 1	system 2
(IEC 1006, DSC, 10 K/MIN)				$T_G [^{\circ}\text{C}]$	$T_G [^{\circ}\text{C}]$
	10 h 90 °C			100 - 110	100 - 110
	4 h 100 °C			115 - 121	117 - 123
	6 h 100 °C			112 - 118	121 - 127
	2 h 110°C			116 - 122	122 - 128
	4 h 110°C			119 - 125	123 - 129
	1 h 120°C			117 - 123	121 - 127
	2 h 120 °C			118 - 124	126 - 132
	4 h 120 °C			120 - 126	126 - 132
FLEXURAL TEST (ISO 178)		<i>After B-Stage</i>		system 1	system 2
CURE CYCLE					
10H 90°C	Flexural strength	[MPa]		135 - 143	135 - 143
	Ultimate elongation	[%]		7 - 8	7 - 8
	Flexural modulus	[MPa]		3000 - 3300	3000 - 3300
4H 100°C	Flexural strength	[MPa]		120 - 130	130 - 135
	Ultimate elongation	[%]		7 - 10	7 - 9
	Flexural modulus	[MPa]		2900 - 3100	2750 - 2950
6H 100°C	Flexural strength	[MPa]		120 - 130	130 - 135
	Ultimate elongation	[%]		8 - 11	9 - 11
	Flexural modulus	[MPa]		2800 - 3000	2750 - 2950
2H 110°C	Flexural strength	[MPa]		120 - 130	125 - 130
	Ultimate elongation	[%]		4 - 7	10 - 13.5
	Flexural modulus	[MPa]		2800 - 3000	2650 - 2850
4H 110°C	Flexural strength	[MPa]		120 - 125	125 - 135
	Ultimate elongation	[%]		5 - 8	5 - 9
	Flexural modulus	[MPa]		2750 - 2950	2700 - 2900
1H 120°C	Flexural strength	[MPa]		115 - 120	115 - 125
	Ultimate elongation	[%]		5 - 7	6 - 8
	Flexural modulus	[MPa]		2700 - 2900	2650 - 2850
2H 120°C	Flexural strength	[MPa]		115 - 120	120 - 125
	Ultimate elongation	[%]		5 - 9	6 - 10
	Flexural modulus	[MPa]		2700 - 2900	2650 - 2850
4H 120°C	Flexural strength	[MPa]		117 - 122	120 - 125
	Ultimate elongation	[%]		7 - 9	7 - 12
	Flexural modulus	[MPa]		2800 - 2900	2650 - 2850

FRACTURE PROPERTIES	After B-Stage		system 1	system 2
BEND NOTCH TEST				
(ISO 13586/3)				
CURE CYCLE				
10H 90°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.25 – 1.35 430 - 470	1.25 – 1.35 430 - 470
4H 100°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.35 – 1.60 500 - 700	1.40 – 1.45 550 - 600
6H 100°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.30 – 1.50 500 - 700	1.45 – 1.60 600 - 750
2H 110°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.60 – 1.80 750 - 900	1.45 – 1.60 600 – 750
4H 110°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.50 – 1.70 650 - 800	1.40 – 1.60 600 - 800
1H 120°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.80 – 2.00 1000 - 1200	1.6 – 1.8 750 - 950
2H 120°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.75 – 1.90 900 - 1100	1.60 – 1.70 750 - 900
4H 120°C	Fracture toughness Fracture energy G_{1C}	[MPa√m] [J/m ²]	1.80 – 1.95 950 - 1150	1.65 – 1.75 800 - 950

**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.

IMPORTANT LEGAL NOTICE

Huntsman Advanced Materials warrants only that its products meet the specifications agreed with the user. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications.

The manufacture of materials is the subject of granted patents and patent applications; freedom to operate patented processes is not implied by this publication.

While all the information and recommendations in this publication are, to the best of Huntsman Advanced Material's knowledge, information and belief, accurate at the date of publication, NOTHING HEREIN IS TO BE CONSTRUED AS A WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING BUT WITHOUT LIMITATION, AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE.

The behaviour of the products referred to in this publication in manufacturing processes and their suitability in any given end-use environment are dependent upon various conditions such as chemical compatibility,

temperature, and other variables, which are not known to Huntsman Advanced Materials. It is the responsibility of the user to evaluate the manufacturing circumstances and the final product under actual end-use requirements and to adequately advise and warn purchasers and users thereof.

Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Advanced Materials containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent on manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

Except where explicitly agreed otherwise, the sale of products referred to in this publication is subject to the general terms and conditions of sale of Huntsman Advanced Materials LLC or of its affiliated companies including without limitation, Huntsman Advanced Materials (Europe) BVBA, Huntsman Advanced Materials Americas Inc., and Huntsman Advanced Materials (Hong Kong) Ltd.

Huntsman Advanced Materials is an international business unit of Huntsman Corporation. Huntsman Advanced Materials trades through Huntsman affiliated companies in different countries including but not limited to Huntsman Advanced Materials LLC in the USA and Huntsman Advanced Materials (Europe) BVBA in Europe.

Aradur is a registered trademark of Huntsman Corporation or an affiliate thereof.

Copyright © 2007 Huntsman Corporation or an affiliate thereof. All rights reserved.

Main Office :
Huntsman Advanced Materials (Switzerland) GmbH
Klybeckstrasse 200
CH-4057 BASEL
Switzerland
+41 61 299 1111