Advanced Materials

HUNTSMAN

LOWER COSTS, FASTER-TO-MARKET WHATEVER YOUR PROCESS

Composite Resin Systems

Our leading composite expertise, broad product range and unique simulation capabilities can reduce development cycles by up to 50%.

MADE POSSIBLE

TAKE THE LEAD IN PRODUCT DEVELOPMENT

At Huntsman Advanced Materials, we make things possible.

You may need to develop lighter, more durable materials. You might want to implement more cost-effective technologies that shorten development cycles with greater certainty and fewer trials. It could be that you need to reduce environmental impact by creating less waste or by enabling customers to use less fuel.

Whatever your requirements, if your business depends upon bringing ideas to market in a shorter time, improving product performance or operating a more cost-effective and sustainable process for the future, our composite expertise, product range and simulation capabilities will deliver the best solution.

BRING IDEAS TO MARKET WITH CONFIDENCE

For over 60 years, Huntsman Advanced Materials has supported many of the world's leading businesses across virtually every market and industry.

This means that with us, you get decades of know-how and expertise in composite synthesis and formulation, enabling you to develop high quality materials that deliver superior mechanical and thermal performance.

After countless successful projects for customers worldwide, we understand the value of dedicated support. Our specialist teams know exactly how to help you create outstanding results by providing technical expertise at every stage of your manufacturing process.

PARTNERSHIP FOCUSED ON PERFORMANCE

Together, we can create new possibilities in design and application. Our extensive portfolio provides you with a unique range of high-performance systems for manufacturing composite parts or semi-finished composite products.

Using cutting-edge technologies to streamline your development route, our experts will ensure optimal adequacy and efficiency between resin systems selection and your processes. We will ensure your products have the properties you require, and you can be confident that results will be more predictable, giving you greater flexibility to drive innovation in your concept designs.

Accelerate your ambitions

↑80% Up to 80% conversion from idea to market

↑50% Up to 50% reduction in time and cost of trials

↑90% Over 90% project success rate in simulation predictions

BUILD CERTAINTY INTO YOUR PROCESS

Ideas
MADE POSSIBLE

Our goal is to bring your ideas to life. No matter how complex or challenging, our composite specialists are ready to help realize your development ambitions.

However, creating new composite solutions isn't a simple process, which is why we deliver a proven approach to take the guesswork out of trials and ensure a faster, more cost-effective route to market.

90%

PREDICT OUTCOMES WITH 90% SUCCESS

Right from the outset, it's important to be certain that the material or part can be produced from a technical

Minimize trial and error
with our unique simulation capabilities

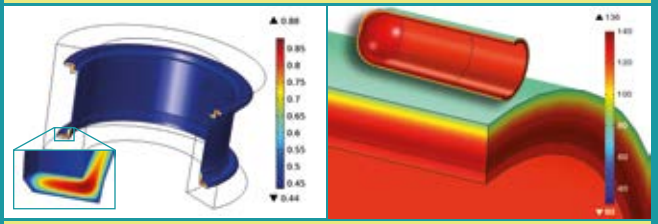
TAILOR RESIN AND PROCESS TO ANY PART

Generation of material models

Accurate rheokinetic data of the resin systems are used to generate material models which are projected onto CAD data. This enables the prediction of the material behavior during material processing and curing at each point on a composite part.

CURE SIMULATION

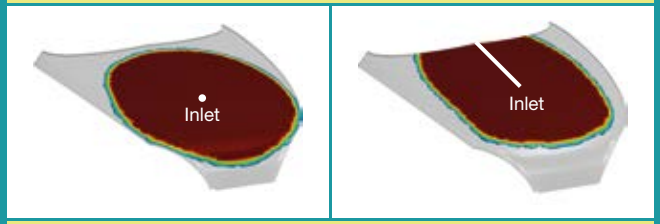
- Curing cycle
- Exotherm temperature
- Evolution of Tg and conversion rate during cure



Prediction of cure progress (left) and exotherm (right)

FLOW SIMULATION

- Flow front evolution and filling time
- Pressure evolution
- Process induced filling variability (e.g. flow channels, inserts)



Impact of inlet geometry on the flow pattern

REDUCED PRODUCTION CYCLES AND DEVELOPMENT TIMES

Resin system selection I Early stage process design I Process parameter determination I Process safety I Improved flow patterns and injection concepts

and economic standpoint, and that it will deliver the right properties you require. Using our unique combination of kinetic and process simulation capabilities, resin characterization methods and mathematical modelling on cure kinetics and flow, you get greater predictability in your development process with a 90% success rate.

↓50%

REDUCE TRIALS BY UP TO 50%

Our simulation technologies also mean you can significantly reduce the number of trials needed for product qualification.

This enables you to save valuable time and cost when designing and determining key product attributes, such as preform and mold temperature, injection speed and time, cure and vacuum time, quantity of resin, maximum pressure, press profile, shrinkage, and more.

↑80%

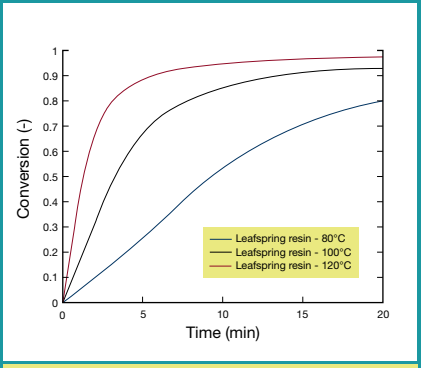
UP TO 80% CONVERSION FROM IDEA TO MARKET

We can also help you to significantly improve conversion from ideas to marketable products. Our dedicated technical service teams of composite experts in chemistry, processing and testing will collaborate with you to deliver the right results, while managing and taking responsibility for a successful outcome.

To date, our onsite and offsite availability ensures that more than 80% of requests are solved before the deadline.

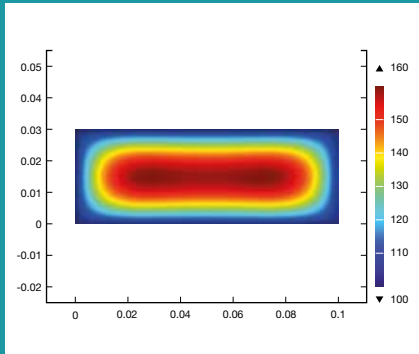
Once you have selected the right materials for your composite part, you can then focus on cost optimization and ensuring your part has the properties you require.

PROCESS PRESELECTION GUIDELINE



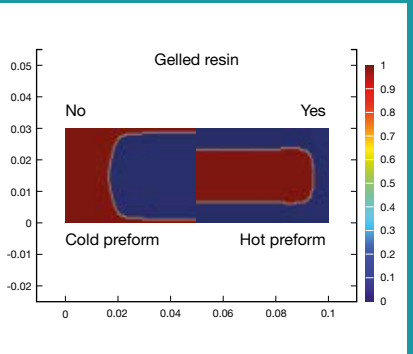
Find the right materials for the composite part you want to produce.

PROCESS SCENARIOS FOR COST OPTIMIZATION



Understand the drivers for cost optimization of your manufacturing process, e.g. thickness of the part, temperature variation, etc.

PROCESS INSIGHT FOR PART OPTIMIZATION



Optimize your part with the right preform heating strategy, e.g. to steer the gelation profile to be able to apply pressure during cure.

QUALITY ISN'T JUST A DRIVER IT'S A PROCESS

Performance
MADE POSSIBLE

Our application engineers can give you expert advice and practical recommendations on how to optimize your chosen manufacturing process. Our core strengths in synthesis and formulation mean you will be fully supported across a broad range of areas, including those highlighted opposite.

It's vital that your product development process integrates superior production efficiency with exceptional end-product performance to deliver a stronger competitive advantage.

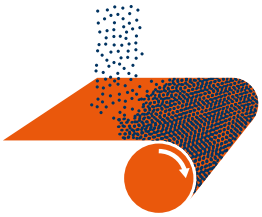
That's why you need a partner with the global resources and experience to support all your product development requirements. With Huntsman Advanced Materials, you can be sure your composite solution will meet demanding and highly regulated specifications – and stay within budgets.

We can help you to drive quality and efficiency across your entire production process, from concept development through to supply security, with proven methods and technologies to reduce costs and maintain a more sustainable business platform.

YOUR PROCESS IS COVERED

Our unique process expertise not only gives you greater confidence when developing new products with specific performance characteristics, but it also means we can support you in other key areas, such as lowering production waste and processing times, and by improving your production line stability.

PREFORMING

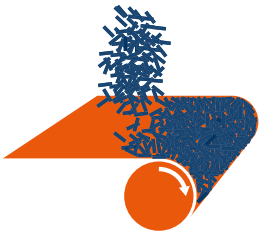


HP RESIN TRANSFER MOLDING

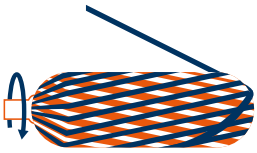
PULTRUSION

WET COMPRESSION MOLDING

SHEET MOLDING COMPOUND



WET FILAMENT / TOWPREG WINDING



DESIGNED TO INCREASE PRODUCTIVITY

AUTOCLAVE QUALITY IN ONE MINUTE

Combining a novel process and fast-cure ARALDITE® epoxy solutions, highly structural parts with outstanding properties and quality can be produced in one minute.

This process is simple, fast and cost effective, requiring low pressure (typically 30 bar) and often removing the need for a fiber preform.

This gives you exceptional benefits versus standard wet compression molding, such as outstanding mechanical performance thanks to fiber volume content up to 65% in a low wastage process, simple processing, even with heavy-tow industrial reinforcements, and void-free parts produced consistently straight from the mold.

PRODUCTION EFFICIENCY WITH DFCM

Dynamic Fluid Compression Molding (DFCM) is a new process that removes the need for high-pressure injection and a bonded fiber preform, eliminating a complex and costly step in production.

Resin impregnation of the fibers through-thickness virtually eradicates fiber-wash; a common problem with high-volume Resin Transfer Molding production parts.

DFCM also reduces void content of laminates in comparison to conventional Wet-Compression Molding. It allows typical porosity content of less than 1%, making it comparable to high-pressure RTM or autoclave prepregs.

Fiber wet-out is so effective that fiber volume contents of 65% can be easily achieved with no special processing conditions.

IMPACT YOUR MARKET NOT YOUR ENVIRONMENT

Tomorrow
MADE POSSIBLE

↓50% Cut manufacturing times by up to 50%

↓45% Reduce weight by up to 45% compared to metallic solutions

Our products and services are used by many of the world's leading businesses in every manufacturing industry, but particularly for automotive, aerospace, marine, and wind energy.

Here, composites are used effectively to create materials that are lighter, stronger, more durable, with better resistance to fire, chemicals and corrosion, and much more.

Many of these properties deliver greater performance regarding fuel efficiency and safety, and are therefore one of the best ways to minimize your – and your customers' – environmental footprint.

CASE 1:

MAKING AIRCRAFT LIGHTER AND MORE EFFICIENT

For aerospace manufacturers, the challenge has always been to find better ways to improve fuel efficiency and to meet emissions targets. Composite materials can be extremely lightweight, compared to traditional materials. They also offer unprecedented design flexibility, vibrational dampening, and a high strength to weight ratio. As such, composites are often used for primary load-bearing structures, high-volume components, and many other secondary parts.

Huntsman Advanced Materials has experience in supporting aerospace manufacturers with bespoke composite solutions that meet demanding characteristics and stringent regulations. Our composite solutions combine minimum weight with excellent mechanical strength to perform in the most demanding applications, including manufacturing, maintenance and repair (MRO).

CASE 2:

DRIVING THE AUTOMOTIVE INDUSTRY

Car manufacturers are constantly looking for ways to improve safety and efficiency, and integrate alternative fuels, such as electricity or natural gas, into their designs. This means they need materials that are more durable in high-use applications and that have better space-to-weight ratios. Composites are the natural solution, especially for parts such as pressure vessels, leaf springs, body in white, wheels and battery housings. However, the challenge has always been to reduce the cost and time of development and production.

Huntsman Advanced Materials works closely with many automotive businesses to reduce development cycles and increase the success rate from idea to market. This is made possible through our team of dedicated experts, our simulation capabilities and mathematical modelling. We can also help to improve production efficiencies by reducing waste and processing times, as well as lowering your environmental impact.

CASE 3:

GET A COMPETITIVE ADVANTAGE IN SPORTS

For athletic and sports equipment, there are many factors that make all the difference. Optimizing weight, strength, flexibility, and fatigue resistance can be the reason your product becomes a market leader.

Our composite solutions provide the strength and flexibility you need to meet required deformation and load tests, as well as a smooth finish and surface quality for maximum comfort. From skis and tennis rackets to archery bows and bicycles, we have been behind countless successful projects for the sports and leisure industry, worldwide.

CASE 4:

PERFORMANCE MATERIALS FOR PERFORMANCE BOATS

Huntsman Advanced Materials has been supporting the marine industry for decades. With exceptional mechanical and dynamic properties, our composite solutions help designers and ship builders to manufacture a broad variety of small leisure craft, power boats and larger luxury vessels.

Our solutions for light and resistant composite materials are ideal for high-stress and corrosive environments, which makes them perfect for building lightweight yet robust high-performance boats and ocean-going vessels.

PRODUCT LIST

At Huntsman Advanced Materials, our products support a wide array of production processes, as well as the repair and maintenance of composite parts.

The following information provides an overview of the production processes supported, and the page on which you can find the relevant products that match your requirements.

FORMULATED SYSTEMS FOR DIRECT LIQUID PROCESSES

Product designation	Wet lay-up	Compression molding	RTM	Infusion	Filament winding	Pultrusion	Pot life	Gel time	Mix viscosity
Conditions							RT, 100ml	80°C	25°C
Norm									
Unit							min	min	mPa.s
ARALDITE® LY 1564 / Hardener XB 3403	•••			•••	••		870 - 1050	40 - 50	150 - 230
ARALDITE® LY 3508 / Hardener XB 3403	•••		••				600 - 720	30 - 36	650 - 800
ARALDITE® LY 1568 / ARADUR® 3489	••		••	•••	••	••	850 - 950	43 - 46	200 - 300
DNV·GL **ARALDITE® LY 1568 / ARADUR® 3492**	••	••	••	•••			300 - 350	23 - 25	250 - 350
DNV·GL **ARALDITE® LY 3505 / Hardener XB 3403**	•••						600 - 720	36 - 48	300 - 400
DNV·GL **ARALDITE® LY 1564 / ARADUR® 3486**	••		••	•••	••	••	560 - 620	33 - 43	200 - 300
DNV·GL **ARALDITE® LY 1583 / ARADUR® 3495**			••	•••	••	••	610 - 660	38 - 42	250 - 300
ARALDITE® LY 3297 / ARADUR® 3298	•••	•••	•••	••			120 - 135	18 - 26	850 - 950
ARALDITE® LY 3508 / ARADUR® 3486	•••	•••	•••	••	••	••	380 - 480	9 - 14 at 100°C	720 - 860
ARALDITE® LY 3585 / ARADUR® 3486	••	••	••	••	•••	••	480 - 580	32 - 40	500 - 650
ARALDITE® LY 3031 / ARADUR® 3032 [2]	••	•••					-	< 15 sec at 140°C	1 700 - 1 900
ARALDITE® LY 3508 / ARADUR® 3475 [2]	••	•••	••• HP [3]			•••	25 - 35	1 - 2 at 115°C	1 100 - 1 300
ARALDITE® LY 3585 / ARADUR® 3475 [2]	••	•••	••• HP [3]			•••	25 - 35	1 - 2 at 115°C	900 - 1 100
ARALDITE® LY 1564 / ARADUR® 5003-1	••	•••	•••				42 - 52	6 - 8	200 - 260 at 40°C
ARALDITE® LY 1564 / ARADUR® 3474	••	•••	•••	••	•••	••	260 - 280	25 - 35	350 - 450
ARALDITE® LY 5052 / ARADUR® 5052	•••	••	••	••			110 - 160	14 - 17	500 - 700
ARALDITE® LY 3585 / ARADUR® 917-1 / Accelerator DY 080						•••	> 48h	15 - 20 sec at 180°C	600 - 700
ARALDITE® LY 3585 / ARADUR® 5003-1	•••	••	••				40 - 48	6 - 8	440 - 500 at 40°C
ARALDITE® LY 1564 / ARADUR® 917-1 / Accelerator 960-1 [1]				••	•••	•••	80 - 90h	30 - 40	450 - 700

[1] Adjustable reactivity with DY 080 and Accelerator 960-1 ratio
[2] Measured with internal release agent (1-2 phr)
[3] High-pressure RTM

••• Highly recommended
•• Recommended

DNV·GL
Germanischer Lloyd (GL) certified

	Applied cure schedule	Tg	Flexural strength	Ultimate flexural elongation	Fracture properties K_{1C} G_{1C}	Key features
		DSC, 10 K/min				
		ISO 11357-2	ISO 178		ISO 13586	
		°C	MPa	%	$MPa\sqrt{m}$ J/m^2	
	8h at 80°C	68 - 72	104 - 115	10.5 - 11.5	1.0 - 1.1 360 - 380	Very latent, low viscosity.
	4h at 60°C + 6h at 80°C	70 - 75	100 - 125	9.0 - 11.0	2.1 - 2.3 1 250 - 1 400	Latent, very high toughness.
	8h at 80°C	78 - 80	120 - 130	9.0 - 10.0	0.7 - 0.8 170 - 210	ARADUR® 3489 and ARADUR® 3492 can be mixed to adjust reactivity at constant resin / hardener mix ratio. ARADUR® 3489 based system provides low exothermic behavior.
	8h at 80°C	80 - 85	125 - 135	7.0 - 7.5	0.7 - 0.8 210 - 230	
	4h at 60°C + 6h at 80°C	78 - 83	110 - 130	10.5 - 13.0	0.9 - 1.1 250 - 280	Very latent system for wet lay-up.
	8h at 80°C	80 - 84	118 - 130	10.5 - 12.5	0.9 - 1.1 260 - 310	Latent, low viscosity.
	8h at 80°C	88 - 89	110 - 115	11.0 - 12.5	0.7 - 0.8 210 - 230	Improved latency and Tg build-up compared to ARALDITE® LY 1564 / ARADUR® 3486.
	8h at 80°C	92 - 98	125 - 130	7.0 - 8.0	0.8 - 1.0 215 - 245	Good mechanical properties after 23°C curing.
	5h at 100°C	95 - 102	110 - 125	10.0 - 12.5	2.2 - 2.4 1 500 - 1 700	Very high toughness.
	2h at 100°C	103 - 112	120 - 130	9 - 12	0.9 - 1.0 250 - 300	Very latent, medium Tg system.
	30 sec at 140°C	95 - 105 CFRP DMA Tg	70 - 80 in tensile	5.0 - 7.0 in tensile	0.9 - 1.1 320 - 380	Very fast cure system for compression molding mass production.
	2 min at 115°C	105 - 115 CFRP DMA Tg	65 - 75 in tensile	9.0 - 10.5 in tensile	1.4 - 1.55 850 - 950	Latent, fast cure and high toughness system for composite mass production.
	2 min at 115°C	105 - 115 CFRP DMA Tg	75 - 80 in tensile	8.0 - 10.0 in tensile	0.8 - 0.9 220 - 300	Latent, fast cure system for composite mass production.
	30 min at 80°C + 2h at 120°C	108 - 115	108 - 118	7.0 - 9.0	0.9 - 1.0 230 - 290	Very fast.
	1h at 80°C + 4h at 120°C	115 - 120	120 - 130	8.0 - 9.0	0.7 - 0.9 200 - 240	Latent, medium viscosity system with high elongation. Suitable for pressure vessel.
	8h at 80°C	114 - 122 (max 120 - 134)	116 - 122	8.5 - 13.5	0.7 - 0.9 192 - 212	Very good mechanical properties after 23°C curing. Aerospace qualified.
	1 min at 160 - 200°C	115 - 135	110 - 120	8.0 - 9.0	0.75 - 0.80 215 - 220	Designed for pultrusion with improved part quality over DY 070 and Accelerator 960-1 based systems.
	30 min at 80°C + 2h at 120°C	120 - 130	115 - 125	6.0 - 9.0	0.8 - 0.9 180 - 230	Medium Tg, very fast.
	4h at 80°C + 4h at 120°C	122 - 130	140 - 150	6.0 - 7.0	0.6 - 0.7 100 - 125	Low temperature cure anhydride curing system.

Continued on next page

Continued

Product designation	Wet lay-up	Compression molding	RTM	Infusion	Filament winding	Pultrusion	Pot life	Gel time	Mix viscosity
Conditions							RT, 100ml	80°C	25°C
Norm									
Unit							min	min	mPa.s
Resin XB 6469 / ARADUR® 2954	••	•••	•••	•••	••	••	740 - 810	38 - 42	220 - 240
Resin XB 3518 / ARADUR® 22962	••	•••	•••	••			210 - 290	15 - 20	400 - 500
ARALDITE® LY 1564 / ARADUR® 22962	••	•••	•••	•••			110 - 150	20 - 30	400 - 600
ARALDITE® LY 1135-1 / ARADUR® 917-1 / Accelerator 960-1 [1]				••	•••	•••	56 - 62	15 - 21 at 100°C	600 - 1 000
ARALDITE® LY 1564 / ARADUR® 2954	••		•••	••	••	••	480 - 600	35 - 45	500 - 700
ARALDITE® LY 3508 / ARADUR® 22962	••		•••				90 - 150	24 - 40	1 800 - 2 100
ARALDITE® LY 556 / ARADUR® 917-1 / Accelerator DY 070 [1]				••	•••	•••	95 - 105h	140 - 160	600 - 900
ARALDITE® LY 3508 / ARADUR® 2954	••		•••	••			320 - 380	9 - 14 at 100°C	2 600 - 3 300
ARALDITE® LY 3585 / ARADUR® 22962	•••	••	••				110 - 125	16 - 20	1 600 - 1 800
ARALDITE® LY 1564 / Hardener XB 3473	•••	••	••	•••	•••	••	84 - 88h	410 - 430	1 000 - 1 200
ARALDITE® LY 556 / ARADUR® HY 906 / Accelerator DY 070 [1]				••	•••	•••	50 - 55h	200 - 280	1 900 - 2 100
ARALDITE® LY 556 / Hardener XB 3473			••	••	••	••	32 - 37h	> 600	5 200 - 6 000
Resin XB 3292 / Hardener XB 3473	••	••	•••		••		78 - 86h	360 - 420	1 600 - 2 000
ARALDITE® LY 1560 / ARADUR® 917-1 / Accelerator DY 079 [1]		••	•••		••	••	> 48h	4 - 6 at 120°C	200 - 300
ARALDITE® CY 179 / ARADUR® 917-1 / Accelerator DY 070 [1]				••	••	••	> 48h	60 - 80	100 - 200
ARALDITE® LY 8615 / Hardener XB 5173		••	•••	•••			300 - 400	24 - 28	270 - 370
ARALDITE® LY 8615 / ARADUR® 8615	••	••	••	•••	••	••	14 - 16h	34 - 38	480 - 580
Resin XB 9721 / Hardener XB 3473		••	••		••	••	80 - 95h	80 - 100 at 120°C	14 000 - 17 000
ARALDITE® FST 40002 / FST 40003		••	•••	•••		•••	> 24h	See data sheet	600 - 800
ARALDITE® FST 40004 / FST 40005		••	•••	•••		•••	> 24h	See data sheet	400 - 500

[1] Adjustable reactivity with DY 070, DY 079

••• Highly recommended
•• Recommended

	Applied cure schedule	Tg	Flexural strength	Ultimate flexural elongation	Fracture properties K_{1C} G_{1C}	Key features
		DSC, 10 K/min				
		ISO 11357-2	ISO 178		ISO 13586	
		°C	MPa	%	$MPa\sqrt{m}$ J/m^2	
	90 min at 80°C + 1h at 150°C	125 - 135	100 - 110	6.5 - 7.5	0.95 - 1.0 350 - 390	Low viscosity, long pot life. Alternative to anhydride for filament winding and pultrusion when hot/wet performance is key.
	1h at 100°C + 2h at 140°C	128 - 138	120 - 135	8.5 - 10.0	0.6 - 0.8 160 - 180	Medium Tg, high elongation at break.
	15 min at 120°C + 2h at 150°C	130 - 140	124 - 132	9.0 - 11.0	0.8 - 1.0 200 - 260	Medium Tg, high elongation at break.
	4h at 80°C + 4-8h at 140°C	132 - 138	150 - 162	6.5 - 8.0	0.57 - 0.65 90 - 115	Medium Tg, very latent anhydride curing system.
	1h at 80°C + 8h at 140°C	143 - 148	120 - 124	6.5 - 7.5	0.7 - 0.8 150 - 180	Medium Tg, alternative to anhydride for filament winding and pultrusion when hot/wet performance is key.
	1h at 80°C + 2h at 150°C	144 - 154	120 - 135	8.0 - 10.0	0.9 - 1.2 340 - 380	Medium Tg, toughened.
	4h at 80°C + 8h at 140°C	148 - 153	125 - 135	6.0 - 8.5	0.5 - 0.6 85 - 95	Medium Tg, very latent anhydride curing system.
	1h at 80°C + 8h at 160°C	150 - 158	125 - 135	7.0 - 8.0	0.8 - 1.0 250 - 290	High Tg, toughened.
	15 min at 120°C + 2h at 150°C	150 - 160	130 - 140	7.5 - 9.0	0.65 - 0.75 130 - 160	Good balance between Tg and elongation at break.
	30 min at 130°C + 12h at 160°C	165 - 175	100 - 110	5.5 - 6.5	0.7 - 0.8 170 - 190	Good chemical resistance.
	2h at 120°C + 8h at 160°C	165 - 175	100 - 140	4.0 - 7.0	0.6 - 0.8 100 - 125	High Tg, very latent anhydride curing system.
	2h at 120°C + 4h at 180°C	185 - 194	110 - 120	5.5 - 6.5	0.7 - 0.9 190 - 220	High chemical resistance.
	2h at 100°C + 1h at 140°C + 1h at 180°C + 2h at 200°C	195 - 203	98 - 108	4.0 - 4.5	0.5 - 0.6 70 - 75	Very high Tg, high chemical resistance.
	20 min at 120°C + 2h at 190°C	195 - 205	70 - 80 in tensile	4.0 - 5.0 in tensile	0.8 - 0.9 230 - 280	Very good combination of mechanical performance and aesthetic. Designed for carbon look applications.
	1h at 100°C + 6h at 180°C	200 - 205	75 - 95	2.0 - 3.5	0.4 - 0.5 65 - 75	Very high Tg, very latent anhydride curing system.
	90 min at 80°C + 1h at 150°C + 1h at 180°C	200 - 207	113 - 117	4.0 - 5.0	0.5 - 0.7 130 - 165	Suitable for tooling application: free stand post-cure after 40°C pre-cure conditions.
	90 min at 80°C + 1h at 150°C + 1h at 180°C	200 - 210	82 - 86	2.5 - 4.0	0.6 - 0.8 130 - 165	Suitable for tooling application: free stand post-cure after 40°C pre-cure conditions.
	2h at 120°C + 2h at 160°C + 2h at 200°C + 4h at 220°C	232 - 238	105 - 125	3.0 - 4.5	0.6 - 0.7 95 - 100	High chemical resistance.
	1h at 100°C + 1h at 120°C + 2h at 180°C	250 - 260	90 - 110 in tensile	4.0 - 6.0 in tensile	0.85 - 0.95 250 - 300	FST (Fire, Smoke & Toxicity) unfilled inherently flame retardant. High mechanical performance. Meets FST according to FAR 25.853.
	1h at 100°C + 1h at 120°C + 2h at 180°C	260 - 270	40 - 50 in tensile	1.0 - 2.0 in tensile	0.55 - 0.65 100 - 150	FST (Fire, Smoke & Toxicity) unfilled inherently flame retardant. Meets HL1 / HL2 according to EN 45545-2 R1/R7.

PREFORMING EPOXY BINDERS FOR RTM PROCESSES

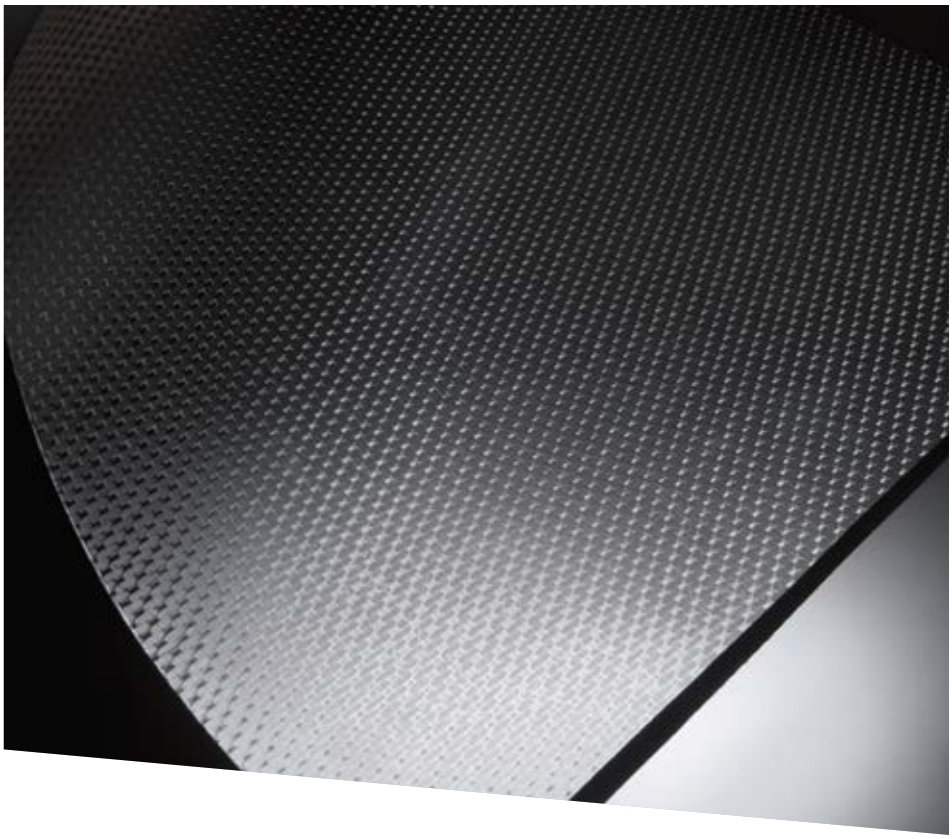
Product designation	Softening point	Tg	Typical preforming cycle	Key features
Conditions		DSC, 10 K/min		
Norm	DIN 51920	ISO 11357-2		
Unit	°C	°C		
XB 6078	85	95-105	120 sec at 140°C up to 45 sec at 180°C	Reactive binder giving very high preform stability. Recommended for high thickness parts and aesthetic applications.
ARALDITE® LT 3366	ca. 150	75 - 85	20 +/- 10 sec at 180 +/- 20°C + cold stamping	Non-reactive epoxy binder for mass production of preforms.

FORMULATED SYSTEMS FOR PREPREGS: CHEMICAL B-STAGE AND HOT-MELT PROCESS

PREPREG SYSTEMS FOR SOLVENT BASED PROCESS ALSO AVAILABLE ON DEMAND

Product designation	Mix viscosity	B-Staging	Shelf-life	Gel time [1]	Applied cure schedule
Conditions	25°C	23°C	23°C	120°C	
Norm					
Unit	mPa.s	h		min	
Chemical B-stage process					
ARALDITE® LY 1556 / ARADUR® 1571 / Accelerator 1573 / Hardener XB 3403	4 000 - 6 000	24 - 48	> 6 weeks	6 - 11	2h at 120°C
ARALDITE® LY 3508 / ARADUR® 1571 / Accelerator 1573 / Hardener XB 3403	6 650 - 7 450	24 - 48	> 4 weeks	4 - 12	4h at 120°C
Hot-melt process					
ARALDITE® LY 3514 / ARADUR® 1571 / Accelerator 1573	14 000 - 15 000 at 70°C	n.a.	> 5 weeks	17 - 21	30 min at 90°C + 2h at 120°C
Resin XB 3515 / ARADUR® 1571 / Accelerator 1573	24 000 - 28 000 at 55°C	n.a.	> 5 weeks	10 - 13	1h at 120°C + 2h at 140°C

[1] Adjustable reactivity with Accelerator 1573 ratio
n.a.: not applicable



	Tg	Flexural strength	Ultimate flexural elongation	Fracture properties K_{1C} G_{1C}
	DSC, 10 K/min			
	ISO 11357-2	ISO 178		ISO 13586
	°C	MPa	%	MPa√m J/m²
	105 - 115	125 - 140	7.0 - 10.0	0.7 - 0.9 130 - 250
	115 - 125	110 - 120	5.5 - 8.0	1.4 - 1.7 850 - 1 000
	120 - 130	135 - 150	6.0 - 9.0	0.8 - 0.9 280 - 320
	140 - 145	120 - 140	4.5 - 6.5	1.2 - 1.3 400 - 440

ADHESIVES FOR STRUCTURAL ASSEMBLIES

Product designation	Chemistry	Pot life	Recommended cure schedule	LSS [1]	Tg	Gap filling	Key features
Conditions		23°C, 100g	23°C				
Unit		min		MPa	°C	mm	
ARALDITE® 2015-1	Epoxy	45 - 60	RT or at elevated temperature	17	60	10	Toughened, Lloyd's Register approved, resistant to weathering.
ARALDITE® 2031-1	Epoxy	60 - 70	RT or at elevated temperature	20	60	10	Toughened, resistant to weathering.
ARALDITE® AW 4858 / Hardener HW 4858	Epoxy	150	RT or at elevated temperature	38	60	10	High peel strength, high toughness.
ARALDITE® 2014-2	Epoxy	110	RT or at elevated temperature	18	75 - 85	5	Resistant to temperature, KIWA approved (contact with drinking water).
ARALDITE® 2019	Epoxy	100	RT or at elevated temperature	33	50 - 120	10	Resistant to high temperature after post cure, high toughness.
ARALDITE® AW 4510 / Hardener HW 4511-1	Epoxy	80 - 90	2h at 110°C or 1h at 130°C	16	120 - 135	10	Resistant to high temperature, resistant to chemicals.
ARALDITE® 2023-10	Acrylic	10 - 20	RT	16	75 - 80	30	Tough flexible bonds, 10 minutes open time, high gap filling, UV stable.
ARALDITE® 2023-30	Acrylic	35 - 50	RT	17	75 - 80	30	Tough flexible bonds, 30 minutes open time, high gap filling, UV stable.
ARALDITE® 2023-60	Acrylic	75 - 95	RT	17	75 - 80	30	Tough flexible bonds, 60 minutes open time, high gap filling, UV stable.
ARALDITE® 2029-1	Polyurethane	35 - 45	RT	24	25 - 35	5	High elongation at break, high strength.

[1] On epoxy composites - LSS = Lap Shear Strength
Note: All adhesives are available in different pack sizes including cartridges for easy use in the field
RT = Room Temperature (23+/-2°C)

ADHESIVES FOR
FAST ASSEMBLIES AND REPAIR

Product designation	Chemistry	Pot life	Recommended cure schedule	LSS [1]	Tg	Gap filling	Key features
Conditions		23°C, 100g	23°C				
Unit		min	min	MPa	°C	mm	
ARALDITE® 2048-1	Acrylic	10	35	24	65 - 75	8	Flexible, gap filling.
ARALDITE® 2051	Acrylic	4 - 6	15	32	120 - 130	1 - 2	Application and curing between 0°C and 40°C even in wet conditions, good adhesion with minimum pretreatment.
ARALDITE® 2050	Acrylic	1 - 2	9	31	120 - 130	1 - 2	Application and curing between -20°C and 25°C even in wet conditions, good adhesion with minimum pretreatment.
ARALDITE® 2012	Epoxy	6	20	18	40 - 50	Self leveling	Short gel time, multipurpose.
ARALDITE® AW 2101 / Hardener HW 2951	Epoxy	6	60	20	40 - 45	5	Rigid, low shrinkage.

Note: All adhesives are available in different pack sizes including cartridges for easy use in the field
[1] On epoxy composites - LSS = Lap Shear Strength

MADE POSSIBLE

HUNTSMAN

Huntsman Advanced Materials

At Huntsman Advanced Materials, we make things possible. Serving many of the world's leading businesses across virtually every industry, we enable greater innovation, performance and sustainability to address global engineering challenges and contribute towards a better quality of life.

Our capabilities in high-performance adhesives and composites, delivered by more than 1600 associates, support over 2000 global customers with innovative, tailor-made solutions and more than 1500 pioneering epoxy, acrylic, phenolic and polyurethane-based polymer products.

We operate synthesis, formulating and production facilities around the world

Distributed by

For more information, please contact us at:
advanced_materials@huntsman.com

For more information
www.huntsman.com/advanced_materials
advanced_materials@huntsman.com

Europe, Middle East & Africa
Huntsman Advanced Materials (Switzerland) GmbH
Klybeckstrasse 200
P.O. Box
4002 Basel
Switzerland
Tel: +41 61 299 1111
Fax: +41 61 299 1112

Asia Pacific & India
Huntsman Advanced Materials
(Guangdong) Co., Ltd,
Shanghai Branch Office
455 Wenjing Road, Minhang District
Shanghai 200245, P.R. China
Tel: +86 21 3357 6588
Fax: +86 21 3357 6547

Americas
Huntsman Advanced Materials Americas Inc.
10003 Woodloch Forest Drive
The Woodlands
Texas 77380
USA
Tel: +1 888 564 9318
Fax: +1 281 719 4047

Ref. No. AdMat Composites selector guide 02.20_EN_EU

Responsible Care®
OUR COMMITMENT TO SUSTAINABILITY

Registered for REACH

Concept and design by www.cbc.dk