SOLVAY

asking more from chemistry®

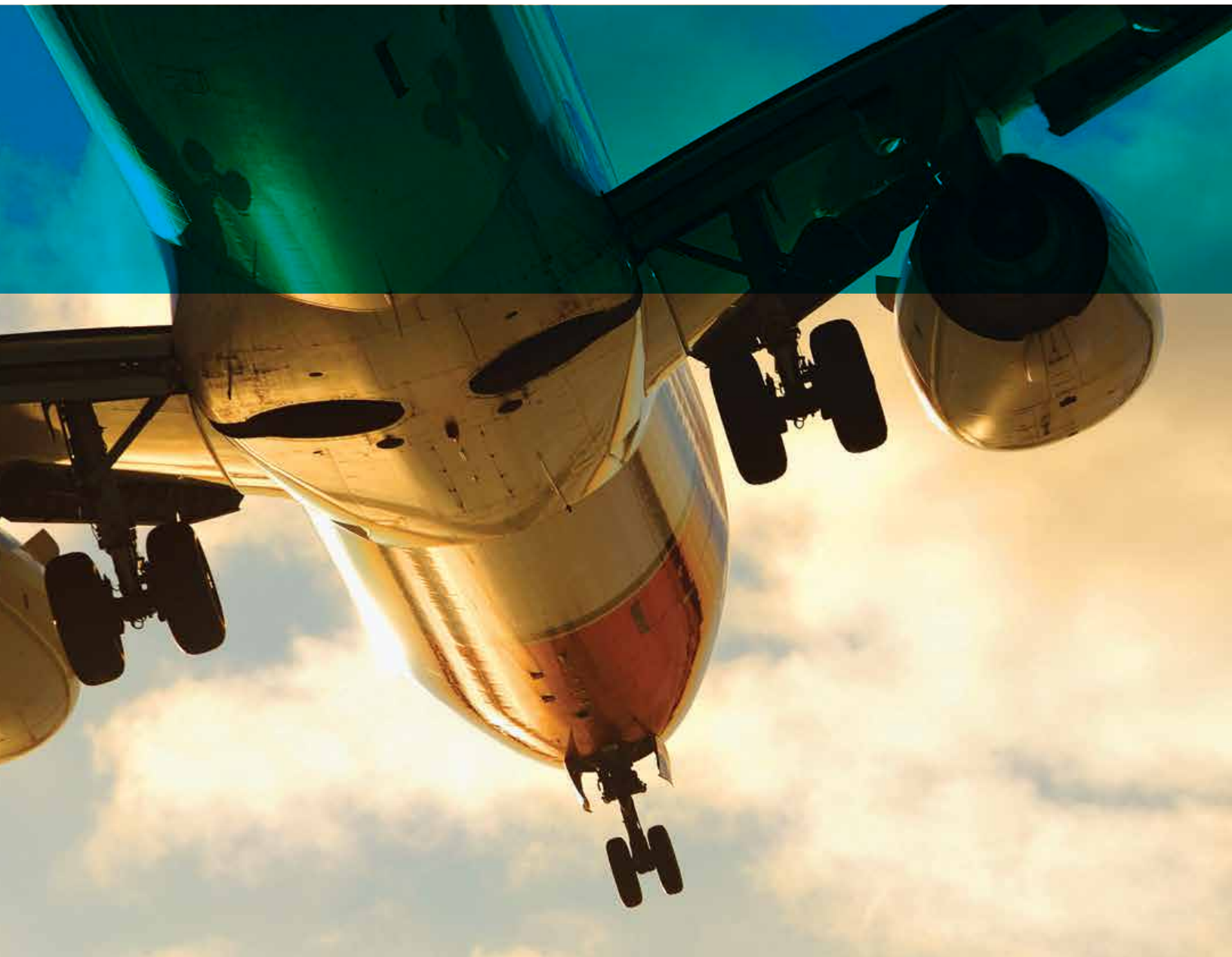
Advanced Composite Materials for

Aerospace

COMPOSITE MATERIALS

Focusing on innovation, advanced technology and application expertize allows Solvay to develop and manufacture products that change the way our customers do business.

As manufacturers across the globe continue to grow, modernize and develop technologies, their need increases for new high-performance materials to improve durability and production, while offering weight savings for the end application.



Solvay's pioneering products perform specific and important functions for our customers, enabling them to offer innovative solutions to the industries they serve.

Optimized Global Operations

Solvay manufactures materials for aerospace applications throughout North America, Europe and Asia and is expanding facilities in many locations. Our global employee base supports the continued growth of composite material adoption with technical professionals located near our customer operations to respond quickly and efficiently.

Our technical service offers:

- Experienced professionals assisting with material evaluation and selection
- Assistance to optimize product versatility within specification requirements
- Direct access for technology collaborations

Diverse Product Portfolio

Solvay delivers an integrated system of products for aerospace applications. From the most extensive qualification base of any aerospace materials provider, Solvay offers a portfolio of composite and adhesive materials for primary and secondary structures, aircraft interior products and processing materials optimized for complex manufacturing methods.

Extensive Technology Application

Solvay is more than an advanced materials manufacturer. We work with our customers to identify the best material for specific applications. This engagement aids in new product development and efficiencies for our customers. Solvay has a long history of products used in diverse applications. This is achieved by working with our customers to solve their challenges.

Our advanced technology includes:

- Toughened epoxy resin systems for primary structure applications
- Polyimide resin systems for extreme temperature applications
- Thermoplastic resin systems for interior and secondary structure applications
- Structural adhesives for primary, secondary and specialty applications

Prepregs and Resin Systems

Primary and Secondary Structures

Thermoset Prepregs

Product/Features	Fiber	Product Form	Fiber aerial Weight (gsm)[1]	Tg °F (°C)	Recommended Cure °F (°C)
CYCOM® 977-2: Toughened epoxy for primary and secondary structure applications	• Standard modulus • Intermediate modulus	• Uni-tape • Plain • 5 harness • 2x2 twill • Film	Tape: 134, 196, 268 Fabric: 193, 280, 370	414 (212) (dry) 313 (156) (wet)	3 hrs at 350 (177)
CYCOM® 5276-1: Highly-toughened epoxy for primary structure applications	• Standard modulus • Intermediate modulus	• Uni-tape • Plain	Tape: 145, 190 Fabric: 193	370 (188) (dry) 310 (154) (wet)	2 hrs at 350 (177)
CYCOM® 5320-1: Toughened epoxy for VBO processing of primary structures	• Standard modulus • Intermediate modulus	• Uni-tape • Plain • 5 & 8 harness	Tape: 145, 190 Fabric: 193, 370	451 (232) (dry) 356 (180) (wet)	3 hrs at 250 (121) plus free standing postcure of 2 hrs at 350 (177)
CYCOM® 5250-4: BMI system for use in primary structure applications	• Standard modulus • Intermediate modulus	• Uni-tape • Plain • 5 & 8 harness	Tape: 145 Fabric: 193, 280, 370	548 (287) (dry) 433 (223) (wet)	6 hrs at 350 (177) plus 6 hrs at 440 (227) postcure
MTM® 45-1: Toughened epoxy for primary and secondary structures	• Standard modulus • Intermediate modulus • E glass, S glass and quartz	• Uni-tape • Plain • 5 harness	Tape: 145, 228 Fabric: 193, 203, 370	356 (180) (dry) 320 (160) (wet)	4 hrs at 250 (121) 3 hrs postcure at 350 (177)
CYCOM® 977-3: Toughened epoxy resin with dry and wet service capability formulated for autoclave or press molding	• Standard modulus • Intermediate modulus	• Uni-tape • Plain • 5 harness	Tape: 145, 228 Fabric: 193, 203, 370	400 (204) (dry) 334 (168) (wet)	6 hrs at 350 (177)
CYCOM® 970: Epoxy resin producing nonporous, void- free honeycomb sandwich structures and laminates	• Standard modulus	• Uni-tape • Plain • 8 harness	N/A	300 (149) (dry) 200 (93) (wet)	2 hrs at 350 (177)
AVIMID® S: Non-MDA addition type polyimide prepreg formulated for press or autoclave cure	• Standard modulus • Intermediate modulus • E glass, S glass and quartz	• Plain • 8 harness • Various	N/A	625 (330) (depending on cure cycle)	5 hrs at 200 (93) plus post cure of 4 hrs at 680 (360)
CYCOM® 5575-2: Modified cyanate ester formulated for high temperature mechanical properties and low dielectric and loss tangent properties	• E glass, S glass and quartz	• Various	N/A	500 (260)	4 hrs at 350 (177) plus post cure for 2 hrs at 440 (227)
CYCOM® 5577-1: Vacuum Bag cure capable low flow modified cyanate ester formulated for high temperature mechanical properties and low dielectric and loss tangent properties	• E glass, S glass and quartz	• Various	N/A	500 (260)	3 hrs at 300 (149) plus free standing post cure of 3 hrs at 350 (177) (VBO cure cycle)

[1] Tapes also available in ATL and AFP grades

Prepregs and Resin Systems (Continued)

Primary and Secondary Structures (continued)

	Product/Features	Fiber	Product Form	Fiber aerial Weight (gsm)[1]	Tg °F (°C)	Recommended Cure °F (°C)
Thermoset Liquid Resins & Reinforcements	**PRISM® EP2400:** Highly toughened RTM resin with low viscosity for primary structure applications	Compatible with carbon, glass and aramid fibers	• Liquid resin	N/A	354 (179) (dry) 325 (163) (wet)	2 hrs at 350 (177)
	CYCOM® 890: RTM resin with 30-day outlife at room temperature	Compatible with carbon, glass and aramid fibers	• Liquid resin	N/A	376 (191) (dry) 336 (169) (wet)	2 hrs at 350 (177)
	CYCOM® PR 520: Highly toughened RTM resin	Compatible with carbon, glass and aramid fibers	• Liquid resin	N/A	322 (161) (dry)	2 hrs at 350 (177)
	CYCOM® 5250-4: BMI RTM resin for primary structure applications	Compatible with carbon, glass and aramid fibers	• Liquid resin	N/A	520 (271) (dry) 405 (207) (wet)	4 to 6 hrs at 350 (177) plus 4 to 6 hrs at 440 (227) postcure

[1] Tapes also available in ATL and AFP grades

Aircraft Interiors

	Product/Features	Typical Reinforcements	Compatible Fabrication Processes	Cure Temperature °F (°C)	Typical Applications
Interior Applications	**CYCOM® 2265:** Self-adhesive phenolic system with low tack and drape	• Fiberglass	Press (MOP), Vacuum Bag	250–275 (121–135)	Side walls, partitions, ceiling panels
	CYCOM® 6070: Rapid-cure phenolic system with low tack and drape	• Fiberglass • Carbon	Press (MOP, Crushed Core)	280–325 (138–163)	Stow bins, side walls, ceiling panels
	CYCOM® 2400-1: Self-adhesive phenolic system available with low, medium or high tack	• Fiberglass	Press, Vacuum Bag, Autoclave	225–320 (107–160)	Drapeable prepreg suitable for complex parts
	L-591: General purpose phenolic system	• Fiberglass	Press, Vacuum Bag, Autoclave	265–360 (129–182)	General aircraft interiors applications
Ducting	**L-728:** Airtight, reinforced phenolic system	• Aramid • Carbon • Fiberglass	Vacuum Bag, Autoclave	275–320 (135–160)	Environmental control system ducting

Thermoplastic Prepregs

	Product/Features	Fiber	Product Form	Fiber aerial Weight (gsm)[1]	Tg °F (°C)	Recommended Consolidation °F (°C)
Structures, interiors, engines and space	**APC-2 PEEK:** High toughness and fatigue resistance and excellent environmental resistance with very low flammability and smoke toxicity	Standard Modulus AS4 12k	• 12” carbon fiber tape	145 (34% resin content)	289 (143)	15-30 min at 720 (382)
	APC PEKK FC: High toughness and excellent chemical resistance with very low flammability and smoke toxicity	Standard Modulus AS4D 12k	• 12” carbon fiber tape	145 (34% resin content)	318 (159)	15-30 min at 710 (377)

Adhesives, Surfacing Films and Primers

Adhesives

Product/Features	Uses	Maximum Continuous Service Temp. °F (°C)	Recommended Cure °F (°C)
FM® 73: Toughened, general purpose aerospace epoxy film	Metal-to-metal bonding; metal-to-composite bonding; honeycomb sandwich bonding	180 (82)	1 hr at 220 (104)
FM® 94: Modified epoxy film adhesive, high temp version FM® 73	Metal-to-metal bonding; metal-to-composite bonding; honeycomb sandwich bonding	220 (104)	1 hr at 250 (121)
Metlbond® 1515-4: Modified epoxy film adhesive; co-cure/co-bonding of composites	Metal-to-metal bonding; composite bonding; cosmetic surfacing	300 (148)	2 hrs at 300 (148)
FM® 209-1: Film adhesive designed for out-of-autoclave processing	Out of autoclave structural bonding of metal and composite monolithic and sandwich structures	250 (121)	1.5 hrs at 250 (121)
FM® 300: High shear strength modified epoxy film adhesive	Metal-to-metal bonding; metal-to-composite bonding; honeycomb sandwich bonding	300 (148)	1 hr at 350 (177)
FM® 300-2: Dual cure capable film adhesive/surfacing film 250°F cure version of FM® 300	Co-cure and secondary bonding; surfacing film	300 (148)	1.5 hrs at 250 (121)
FM® 377: Toughened epoxy film adhesive, superior performance on co-cure and secondary composite bonding	Metal-to-metal bonding; composite bonding; honeycomb sandwich bonding	350 (177)	1.5 hrs at 350 (177)
FM® 309-1: Next generation composite bonding film adhesive with high shear and peel performance	Composite co-cure, co-bond and secondary bonding; honeycomb sandwich bonding; metal bonding; out-of-autoclave capable	350 (177)	1.5 hrs at 350 (177)
FM® 450-1: Next generation BMI film adhesive	Monolithic and honeycomb core bonding	450 (232)	4 hrs at 375 (190) plus post cure
Metlbond® 2550: Modified BMI film adhesive	Metal-to-metal bonding; metal-to-composite bonding; composite bonding; honeycomb sandwich bonding; out-of-autoclave capable	400 (204)	6 hrs at 350 (177) plus 6 hrs at 400 (204)
FM® 385: Modified high temperature epoxy adhesive film	Metallic and non-metallic monolithic/sandwich bonding for aircraft nacelle structures. Very high shear at 350°F/ 177°C with good peel strength. Continuous service at 350°F/177°C.	350 (177)	1.5 hrs at 350 (177)
FM® 57: Condensation polyimide adhesive film	Metallic and non-metallic bonding; honeycomb sandwich bonding; repair, radar transparent structure bonding	550 (287)	1.5 hrs at 350 (177) plus 2 hrs at 550 (287) post cure
Metlbond® 2555: Modified cyanate ester film adhesive	Honeycomb sandwich bonding; metal-to-metal bonding; metal-to-composite bonding; composite-to-composite bonding; radome and satellite applications	400 (204)	6 hrs at 350 (177) plus 2 hrs at 400 (204) postcure

Adhesives, Surfacing films and Primers (Continued)

	Product/Features	Uses	Maximum Continuous Service Temp. °F (°C)	Recommended Cure °F (°C)
Peel Ply	**FM® 3500EZP:** Resin impregnated glass fabric peel ply formulated for easy one-piece removal	Composite surface preparation for cobonding and secondary bonding applications	Compatible with epoxy prepregs	Compatible with epoxy prepregs
Core Splice Foam	**FM® 490A and FM® 490B:** Modified epoxy core splice adhesive	Honeycomb splicing; local reinforcement; bonding of edge members and inserts	350 (177)	1 hr at 250 (121) to 350 (177)
	FM® 410-1: Modified epoxy adhesive foam	Honeycomb splicing; local reinforcement; bonding of edge members and inserts	350 (177)	1 hr at 250 (121) to 350 (177)
	FM® 6604-1: Modified BMI core splice foam	Non-metallic core splice and edge closeout	450 (232)	4 hrs at 350 (177) plus 6 hrs at 440 (226) postcure
Primers	**BR® 127:** Modified epoxy corrosion inhibiting primer	Compatible with essentially all 250°F (121°C) film adhesives; protects prepared surfaces from oxidation	300 (148)	4 hrs at 180 (82) to 0.5 hrs at 250 (121)
	BR® 6747-1: Water-based adhesive bonding primer with zero VOCs	Compatible with most 250°F (121°C) to 350°F (177°C) film adhesives	350 (177)	1 hr at 250 (121)
	BR® 6747-1 NC: Non-chromated version of BR® 6741-1	Compatible with most 250°F (121°C) to 350°F (177°C) film adhesives	350 (177)	1 hr at 250 (121)
Surfacing	**SURFACEMASTER® 905:** Industry standard composite surfacing film and lightning strike protection	Co-curable with 250°F (121°C) and 350°F (177°C) composite resins; virtually eliminates surface porosity and imperfections; allows paint application without primer; ATL compatible	350 (177)	1 to 1.5 hrs at 250 (121) to 350 (177)

Process Materials

We offer a comprehensive range of process materials also referred to as vacuum bagging consumables:

Range of process materials:

Vacuum bagging film | Breather fabric | Flow media | Combination products | Release film | Peel ply | Release fabric | Sealant tape | Adhesive tape | Self-adhesive tool release | Rubber | Tapes and sprays | Fittings and hoses | Hoses, wrap and connectors

For more information on those products please refer to the Process Materials brochure

These process materials are available as roll stock or as engineered kits. Kits dramatically reduce the total part manufacturing cost whilst offering potential improvements in part quality. Different customer set ups will make one of these two options the best fit to their manufacturing needs.

To find out more about the range of kits available, please refer to our Kitting brochure.

Tooling

Our tooling offering is one of the most extensive in the industry and includes:

- Tooling prepregs (Epoxy and BMI) combining good mechanical performance and toughness for the manufacture of robust tooling
- Full range of tooling ancillaries, including tooling block, backing structures and sealing systems
- Tooling hardware manufacture, including composite tools, and reusable vacuum bags (RVBs) made from silicone and boosting the industry's most advanced sealing systems

To find out more about our tooling range, please refer to our Tooling brochure.

SOLVAY

asking more from chemistry®

Solvay
Composite Materials
2085 E Technology Cr #300
Tempe, AZ 85284 USA
custinfo@solvay.com

A4 Aerospace 2016

www.solvay.com