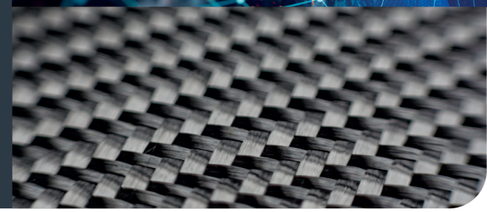
Composite and Speciality Materials for Aerospace

SYENSQO
ADVANCING HUMANITY

Syensqo's broad portfolio of composites, specialty polymers, structural adhesives, and surfacing products are designed for use in a wide variety of aerospace applications, including primary and secondary structures, interiors, propulsion components and electrical/fluid systems.

Our team of experienced scientists and engineers are continuously researching innovative solutions to meet the needs of the aviation industry and we offer a range of products and brands to aid manufacturers every step of the way.

We are committed to partnering with our customers to provide technical support throughout the programm life-cycle: from development and design through to certification and production industrialization.



Optimized Global Operations

Syensqo 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 and specialty material adoption with technical professionals located near our customer operations to respond quickly and efficiently.

Technical Service Support

- Experienced professionals assisting with material evaluation and selection to help optimize product versatility within specification requirements
- State-of-the-art materials and testing lab
- Direct access for technology collaborations
- Guidance on program qualifications, applications engineering, manufacturing and processing support

Diverse Product Portfolio

Syensqo delivers an integrated system of products for aerospace applications including a multitude of NCAMP qualified materials that can greatly reduce the costs and timescales associated with material adoption onto a program. Our broad portfolio of composites, specialty polymers, structural adhesives, and surfacing products are designed for use in a wide variety of aerospace applications, including primary and secondary structures, interiors, propulsion components and electrical/fluid systems.

Application Expertise

Syensqo 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. By working closely with our customers to solve their unique challenges, Syensqo established a rich history of diverse product applications that is unparalleled in the industry.

Our Advanced Technology

- Highly toughened epoxy for primary structures and advanced toughened epoxy for primary as well as secondary application
- BMIs and polymide resin systems for high and extreme temperature applications
- Thermoplastic resin systems for interior and secondary structure applications
- Structural adhesives and surfacing for primary, secondary and specialty applications

Composite Materials

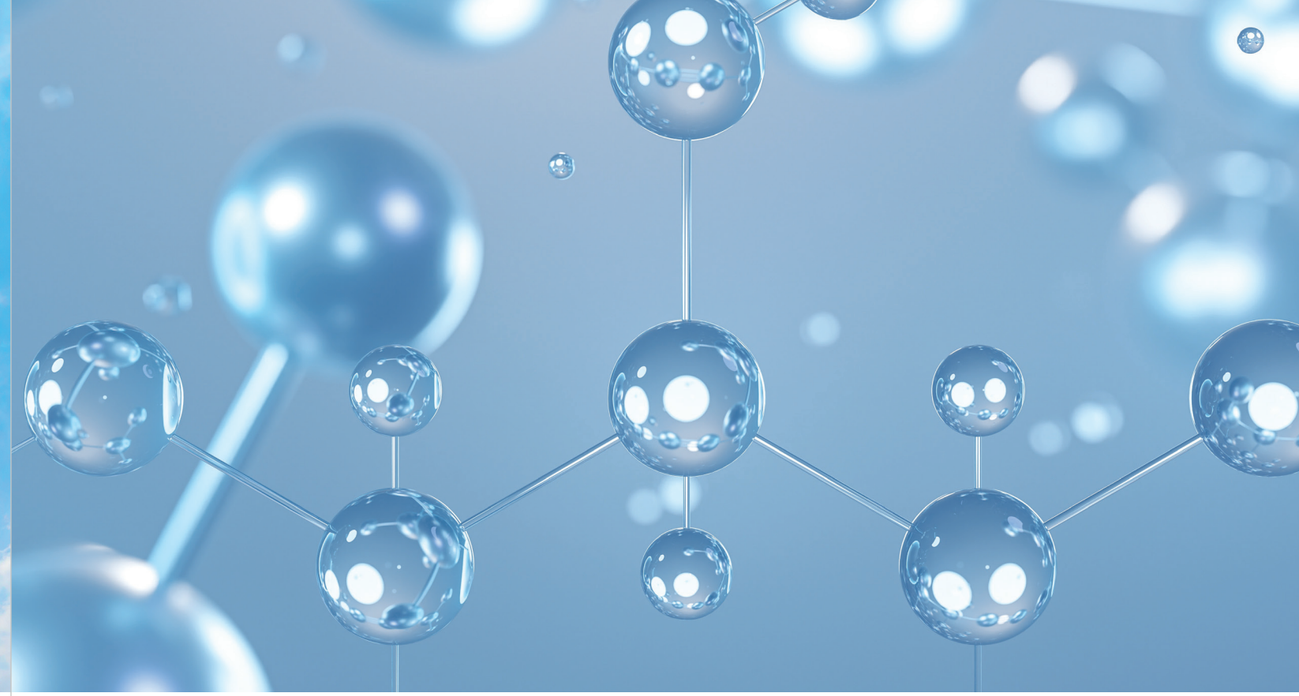
Syensqo is a leading provider of carbon fiber, advanced composite materials, adhesives and surfacing films for the aerospace industry.

By combining 50 years of technology heritage, a comprehensive product portfolio and expertise in product development and application engineering, we deliver innovative customer solutions that maximize technology capability and simplify manufacturing.

Syensqo scientists and engineers work together to develop high performance materials that meet the growing needs of our customers compatible with automated processes, high production rates and lower total cost of ownership.

BENEFITS

- Lightweighting
- Improved durability
- Design freedom
- Part and system integration
- High-rate manufacturing
- Automation and lower total cost of ownership
- Improved and optimized exterior finishes



Specialty Polymers

Syensqo is a world leader in high-performance Specialty Polymers. We provide you with the broadest selection of advanced materials for the aerospace industry.

Within Syensqo's dedicated research and innovation centers our world-class scientists are working to develop polymers, fluids and elastomers that provide competitive solutions for our customers.

Each of our products are created to maintain optimum performance even in the harshest of environments, offering a unique combination of properties that help them achieve exceptional results. Syensqo's Specialty Polymers are innovative, top-tier solutions and our broad portfolio of advanced materials makes us an industry leader.

Our focus is on engineering innovation and we work with our customers at the forefront of their markets to provide innovative solutions that meet their needs.

BENEFITS

- Extreme heat resistance
- Chemical inertness
- Strength
- Toughness
- Lightweighting
- Design flexibility
- Optimized mechanical performance
- Fatigue and wear resistance
- High-quality surface finish

Prepregs and Resin Systems

Primary and Secondary Structures

All properties are for guidance only.

	Product/Features	Fiber	Product Form	Fiber Aerial Weight (gsm)[1]	Tg °F (°C)	Recommended Cure °F (°C)
Thermoset Prepregs	**CYCOM® EP2190:** Highly-toughened epoxy for primary structure applications	• Standard modulus • Intermediate modulus • E glass and S glass	• Uni-tape • Various fabric formats	Tape: 145, 190 Fabric: 193	370 (188) (dry) 291 (144) (wet)	2 hrs at 350 (177)
	CYCOM® EP2750: Fast cure toughened epoxy for press forming of primary/ secondary structures	• Standard modulus • E glass	• 8 harness • 2x2 twill	376 (3K 8HS), 199 (2x2 Tw), 285 (2x2 Tw)	377 (192) (dry) 334 (168) (wet)	20 min at 350 (177) and 30 min at 350 (177) postcure. Autoclave: 45 min at 350 (177)
	CYCOM® 5320-1: Toughened epoxy for VBO processing of primary structuress	• Standard modulus • Intermediate modulus • E glass, S glass and quartz	• Uni-tape • Plain • 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 • E glass, S glass and quartz	• Uni-tape • Plain • 4, 5 & 8 harness	Tape: 145 Fabric: 193, 203, 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 and S glass	• Uni-tape • Plain	Tape: 145 Fabric: 193, 203	356 (180) (dry) 320 (160) (wet)	4 hrs at 250 (121) 3 hrs postcure at 350 (177)
	CYCOM® 977-2: Toughened epoxy for primary and secondary structure applications	• Standard modulus • Intermediate modulus • E Glass	• Uni-tape • Plain • 5 harness • 2x2 twill	Tape: 134, 196, 268 Fabric: 193, 280, 370	414 (212) (dry) 313 (156) (wet)	3 hrs at 350 (177)
	CYCOM® 977-3: Toughened epoxy resin with dry and wet service capability formulated for autoclave or press moulding	• Standard modulus • Intermediate modulus • E Glass, S Glass	• Uni-tape • Plain • 4 & 5 harness	Tape: 145 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	Tape: 145, 190 Fabric: 193	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	• 8 harness	Fabric: 370	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)
	MTM® 46: Epoxy resin with flexible cure capability; VBO, press and autoclave curing; can be cured at temperatures as low as 176 (80)	• Standard modulus • E glass	• Uni-tape • 2x2 twill • Various	Tape: 145 Fabric: 199, 370	284 (140) (dry) 248 (120) (wet)	90 mins at 275 (135)

Prepregs and Resin Systems (continued)

Primary and Secondary Structures

All properties are for guidance only.

	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 fibres	• 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 fibres	• 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 fibres	• 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 fibres	• 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
Interios Application	**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
	MTM® 82S: Controlled flow general purpose phenolic system with good mechanical properties and excellent fire, smoke and toxicity performance	• Fiberglass	Press, Vacuum Bag, Autoclave	275–320 (135-160)	Galley's andgeneral aircraft interiors applications

Thermoplastic Prepregs

	Product/Features	Fiber	Product Form	Fiber Aerial Weight (gsm)[1]	Tg °F (°C)	Recommended Consolidation °F (°C)
Structures, interiors, engines	**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 fibre 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	Intermediate modulus	• 12" carbon fibre tape	145 (34% resin content)	318 (159)	15-30 min at 710 (377)

Adhesives, Surfacing Films and Primers

All properties are for guidance only.

	Product/Features	Uses	Maximum Continuous Service Temp. °F (°C)	Recommended Cure °F (°C)
Adhesive	**Aeropaste®:** High performance paste adhesives for cost-efficient rapid assembly	Metal-to-metal bonding; metal-to-composite; Out-of-autoclave capable; broad range of cure temperatures	Up to 285 (140) dry and 250 (121) wet	From room temperature 75-300 (24-149)
	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)	2 hrs at 300 (148)
	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 ad-hesive	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® 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
Surface Preparation	**FM® 3500EZP:** Resin impregnated glass fabric surface preperation formulated for easy one-piece removal	Composite surface preparation for cobonding and secondary bonding applications	Compatible with epoxy prepregs	Use prepreg cure cycle
	FusePly™: Resin impregnated peel ply designed to create reliably bonded structures	Composite surface preparation for cobonding and secondary bonding applications.	Compatible with epoxy prepregs	Use prepreg cure cycle

Adhesives, Surfacing Films and Primers (continued)

All properties are for guidance only.

	Product/Features	Uses	Maximum Continuous Service Temp. °F (°C)	Recommended Cure °F (°C)
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® 179: Next generation, sustainable corrosion inhibiting non-chromate primer	Compatible with most 250°F (121°C) to 350°F (177°C) film adhesives	-67 (-55) to 300 (149)	1hr at 250 (121) ± 10 (5.5) after drying
	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)

Tooling

We offer an extensive range of tooling solutions based on both epoxy and BMI chemistries with excellent mechanical performance and cure options.

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

Thermoplastic Resins and Specialty Compounds

All properties are for guidance only.

Thermoplastic Resins / Specialty Compounds

Product	Application	Key Attributes	Tg °F (°C)	CF	GF	LGF	LCF
Torlon® PAI	Brackets, clip nuts, clamps, fasteners, electrical and friction and wear components	• Best-in-class friction and wear performance • Excellent strength and toughness • Excellent resistance to a wide range of chemicals	509 (265)	●	●		
KetaSpire® PEEK	Tubing, pipes, brackets, clip nuts, clamps, fasteners, electrical and friction and wear components	• Long-term thermal-oxidative stability up to 240°C • Best-in-class fatigue and creep resistance • Outstanding chemical resistance	302 (150) - 338 (170*)	●	●		
AvaSpire® PAEK	Air duct components, brackets and fasteners	• Higher stiffness from 150°C to 190°C vs PEEK • Improved ductility and toughness vs PEEK • 30% lower cost vs PEEK	302 (150)	●	●		
Ryton® PPS	Connectors and other electrical components	• Thermal stability • Chemical resistance • Inherent flame retardancy	185 (85)	●	●		
Ixef® PARA	Seat armrest	• High strength and rigidity • Excellent surface appearance • High flow for thin-walled parts	185 (85)	●	●	●	
Radel® PPSU	Passenger service units, decompression grilles and food trolley	• High HDT of 207°C (405°F) • Impact strength similar to PC • Better chemical resistance than PEI	428 (220)				
Hyflon® PFA/MFA	Wire and cable and coatings	• Intrinsic processing stability • Inherent flame retardantcy • Chemical Resistance up to 220°C	257 (125)				
Tecnoflon® FKM/FFKM	Seals, O-rings and gaskets	• Highly resilient synthetic rubbers that retain critical properties in chemically aggressive environments at extreme temperatures	-36.4 (-38) -30.2 (-1)				
Galden® PFPE	Coolant for galley	• Inert, high-performance, fluorinated fluids that offer good dielectric properties, exceptional chemical stability • No toxicity and no ozone depletion	<-112 (<-80)				
Fomblin® PFPE	Lubrification of critical components such as wing flap and tail rudder/speed brake actuators; and hydraulic system	• Unmatched chemical and solvent resistance • Easily formulated into greases • Long life lubrication (years)	<-112 (<-80)				

All properties are for guidance only.

Thermoplastic Resins / Compounds

Product	Application	Key Attributes	Tg °F (°C)	CF	GF	LGF	LCF
Xencor™ LFT	Parts requiring high stiffness / toughness in a wide T range; Permanently loaded parts	• High stiffness at low and room temperature • Excellent wear resistance	140 (60) - 275 (135)	●	●	●	●
Additive Manufacturing	Interiors and structural parts	• Highest levels of strength and stiffness, flame resistance, chemical resistance, and reliable performance in high and low temperatures • Increased design freedom/ flexibility	185 (85) - 428 (220)	●	●		
Ajedium® Films	Window shades, insulation blankets, interior decorative laminates and cargo liners	The versatile range of Ajedium® thermoplastic films is formulated to exhibit specialty properties that cannot be found in commodity films or other materials Full spectrum of high performance films: • Thickness capabilities of 1/4 mil (6 microns) to 3+ mm • Width capabilities at 60+ inches (1.52+ m) • Width capabilities up to 59" (1.5m) -- thickness/ material dependent	185 (85) - 428 (220)				

*KetaSpire XT is the highest temperature PEEK in the industry

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