



INNOVATIVE PLASTICS

LIGHTWEIGHT+ COMPLIANT

Next Generation Solutions for Aircraft Designers



CHEMISTRY THAT MATTERS™

A GLOBAL SOLUTIONS PROVIDER

The value we offer begins with our commitment to drive the success of our customers. We're here to support – on the ground, in the air and for the long run. We understand that the advanced materials we provide are only as good as the innovations they empower the industry to implement. Our global footprint, backed by technology and application development support, enables SABIC to help our customers achieve their commercial ambitions. Together we can redefine the limits of performance, safety and compliance, helping to shape the aircraft industry of tomorrow.

INNOVATING FOR CUSTOMER SUCCESS

We believe that SABIC customers deserve the full benefit of every advantage our enterprise can offer.

After all, our success is defined by our customers' success. And with more than 80 years of experience pioneering advanced engineering thermoplastics, SABIC's Innovative Plastics business is positioned to help create new opportunities for growth, breakthrough applications and sustainable solutions.

We invite designers and OEMs to move their best ideas forward with new material opportunities, combining precise performance qualities with improved processability and uncompromised compliance. It's an application-driven business we're in, and we're in it to help our customers transform the industry.

Because your success is how we measure ours.

We offer expertise and experience to our customers in a variety of ways:

- Material solutions to help drive innovation and market leadership.
- Design, logistics and processing expertise to spark new ideas and better efficiencies.
- Unwavering commitment to build long-term relationships with ingenuity, trust and continuous improvement.

It's what we strive for and work to deliver... a mutual benefit.

Excellence and nothing less.

EXPERIENCE THAT COUNTS

SABIC's Innovative Plastics business has been a strategic solution provider for the aircraft industry from the beginning, pioneering new material technologies to make aircraft lighter, more efficient, enjoyable, comfortable, safer and more sustainable.

Today, SABIC continues to invest in game-changing thermoplastic resins, sheet, foam, film and composite technologies that offer the advanced material solutions our customers demand. If you believe that we're standing at the threshold of a new era in aviation design, you're not alone. SABIC's portfolio of aero-enabling products and advanced material technologies can help re-write the rules on weight reduction, impact and chemical resistance, heat performance, smoke and toxicity, cabin noise and flame retardancy.



We help our customers provide innovative solutions to the industry's most pressing challenges:

- Lower aircraft weight for increased fuel efficiency
- Reduced operational and maintenance costs
- Design flexibility
- Durability
- Lower cabin noise
- Enhanced passenger safety
- Compliance to FAA, Boeing and Airbus specifications

It's all part of our commitment to serve the aircraft industry with product innovations and business support to achieve new heights in safety, efficiency and profitability.

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WHERE COMPLIANCE IS KEY

When it comes to limiting flammability, smoke density and toxicity, aircraft manufacturers demand more from their materials. SABIC offers a complete selection of advanced thermoplastic solutions designed to enable designers and OEMs to attain unprecedented levels of safety and compliance without compromising performance.

A RANGE OF OSU (HEAT RELEASE)-COMPLIANT MATERIALS

SABIC has a wide range of resins, sheets and film that comply with OSU requirements and span a variety of viscosities for injection molding, extrusion or blow molding, as well as foam and fiber processing.

They include:

OSU-COMPLIANT RESINS, COMPOUNDS, FOAM AND FIBER

ULTEM™ 9085 resin

ULTEM foam and fiber

THERMOCOMP™ EC008PXQ
compound

THERMOCOMP LC008EXQ
compound

LEXAN™ FST9705 resin

ULTEM AR9000 series resins

EXTEM™ UH1006 resin

EXTEM XH1005 resin

OSU-COMPLIANT SHEET AND FILM

ULTEM 1668A sheet

LEXAN XHR5000 sheet – NEW!

LEXAN XHR6000 sheet

LEXAN XHR6005 sheet – NEW!

LEXAN FR60 film

LEXAN XHR A13 film – NEW!



CABIN INTERIORS

STRONG, LIGHTWEIGHT SOLUTIONS FOR CABIN INTERIORS

WINDOWS AND DOORS

LIGHTING AND SIGNAGE

PASSENGER SERVICE UNITS

OVERHEAD STORAGE UNITS

PROFILE EXTRUSIONS AND TRIMS

VIDEO BEZELS AND SCREEN COVERS

Going beyond the state of the art with smarter designs and better materials has led to aircraft today that are lighter, more fuel efficient, more comfortable and safer than ever.

Building upon the outstanding performance of LEXAN polycarbonate resins and flame-resistant ULTEM resins, SABIC is expanding its portfolio of material solutions to help aircraft manufacturers develop the next generation of interior components.

LEXAN RESIN, SHEET AND FILM

Already a familiar fixture aboard today's aircraft, LEXAN polycarbonate is a tried and true performer, especially when it comes to tough durability, clarity and aesthetic appeal.

LEXAN FST9705 RESIN AND LEXAN XHR6000 SERIES SHEET

Available in both resin and sheet form, this engineering plastic breakthrough combines the processing window and aesthetic flexibility of polycarbonate with the heat release, fire, smoke and toxicity

compliance of PEI resins. It's available in custom colors and can address a wide range of performance targets – from enhanced chemical resistance to high ductility to rugged durability and UV stability.

Extremely low heat release and potential for significant weight-out, revolutionary LEXAN XHR 6000 sheet series can deliver superior weight-out of up to 12 percent vs. traditional polyvinyl chloride (PVC)/polymethyl-methacrylate (PMMA) products while fully complying with FST requirements (FAR 25.853) of major OEMs for cockpit linings, window surrounds, door shrouds, and other interior components. Available in a variety of colors, and with suede, polished, and a new super low gloss velvet texture, LEXAN XHR sheet can reduce production costs, eliminate paint and withstand punishment in high-abuse applications.



CABIN INTERIORS

LEXAN XHR FILM

Newly developed LEXAN XHR film provides the same burn performance offered by LEXAN FST9705 resin in thin-film form. This new film offers engineers and product developers a film grade that helps maintain – or possibly add – robustness in multilayer constructions. LEXAN XHRA13 film may be used as an adhesive for ULTEM foam or as backing layers for fabrics for added performance. It may also be considered for other film applications requiring strict OSU heat release compliance, vertical burn performance, low smoke generation and toughness. Standard gauges available include 2, 3, 5 and 7mil.; other gauges may be available upon request.

NEW LEXAN XHR5000 sheet, utilizing a new copolymer formulation for added opacity, was designed for multi-layer aircraft window shade systems requiring advanced flame-smoke-toxicity (FST) properties and high opacity. This new product helps improve comfort in the cabin environment with a high quality appearance and enhanced room-darkening properties. Supplied as a white-pigmented cap layer over a black base, LEXAN XHR 5000 sheet is engineered as a robust yet lightweight substrate to be laminated with decorative films and then thermoformed.

Transparent LEXAN F2000A, 9600 and F2100 series sheets have excellent FST characteristics along with high-impact strength, making them excellent candidates for applications such as post-decorated transparent thermoformed parts, light diffusers, racks and signs. Imagine what you can do with tough clarity and vertical burn compliance. We did.

SABIC's LEXAN sheet portfolio also contains a broad range of materials for clear and tinted options with added durability and chemical resistance. LEXAN MRAC and LEXAN FMR604 sheets are optical grades with proprietary coatings for maximum service life.

With its ability to be draped or thermoformed into complex 3D shapes with no loss of performance or property retention, LEXAN F6000 sheet is an excellent replacement for traditional PVC-based sheet products – and it's much lighter. LEXAN F6006 sheet offers a suede-like finish, while our newest velvet texture (F6005 sheet) provides a low-gloss effect. On average, an aircraft will burn about 0.03kg (.06lbs) of fuel for each kilogram (2.2lbs) carried on board per hour. Given that a commercial fleet flies about 57 million hours per year, cutting one kilogram per flight can save roughly 1,700 tons of fuel and 5,400 tons of carbon dioxide (CO₂) per year¹. SABIC's new high performance technologies for the aircraft sector can deliver important benefits. For example, on an aircraft with 190 seats, using LEXAN F6000 sheet instead of traditional PVC/acrylic products for seating frames could reduce weight by approximately 23 percent up to 53kg (117lbs). Plus, it comes in range of seemingly limitless and attractive custom colors including metallic.

Other LEXAN resins feature aesthetic choices from crystal clear to high chroma color pigmentation. For example, LEXAN CFR5630 is new clear flame retardant resin available in clear and custom colors that may be used for small lenses. LEXAN CFR5630D is SABIC's newest aerospace grade for LED lighting, offered in five different diffusion options.

Free yourself to innovate with the many material advantages of LEXAN polycarbonate resin, sheet and film. If you're ready to move the needle on weight, performance, safety, styling and cost...

Think SABIC.

¹Calculations based on a total commercial fleet (approximately 25,000 planes) that flies about 57 million hours per year. Source: www.enviro.aero.

FLAME-RESISTANT ULTEM RESIN AND SHEET

As the demand to meet the challenges of today's civilian and military aircraft industries grows, so does the list of game-changing material technologies from SABIC. Aircraft designers and OEMs around the world are challenged to create compliant products that can withstand heat without sacrificing stability and aesthetic flexibility. SABIC's line of ULTEM resins offers compliant solutions for precise performance needs.

ULTEM 9085 resin is a new-generation product that goes beyond compliance with better flow, improved impact performance, lower processing temperatures and a wider processing window – all while maintaining its high modulus and heat resistance. For customers, that means key advantages like thinner walls, lower cost and lighter weight. ULTEM 9075 resin is a product with a proven track record in the aircraft industry for use in many cabin interior applications such as passenger service units and window frames. For extruded profiles, ULTEM 9076 resin has lower flow behavior, allowing an improved processing window.

ULTEM SHEET MATERIAL

By incorporating ULTEM 1668A sheet, designers can achieve halogen-free compliance along with superior stiffness and the ability to safely combine with leather-based decorative skins as well as a variety of adhesive systems used for bonding to plastic substrate. Application opportunities for this advanced lightweight material include first-class and business-class seats and cockpit panels.



SABIC provided parts made from ULTEM 1668A sheet for the development of Adder cabin dividers.



Thermoformed by Texstars Inc., ULTEM 1668A sheet forms the entire cockpit of C17 jetliners. The material was chosen for its flame, smoke and toxicity performance and for its exceptional impact strength.



Vaupell aircraft video display molded from ULTEM 9075 resin



Goodrich Hella Aerospace Lighting Systems passenger service unit using ULTEM resin

CABIN INTERIORS

CABIN INTERIOR CASE STUDIES

BUCHER LEICHTBAU AG

Leading industrial designer Patrick Lindon selected lightweight, transparent LEXAN F2000A sheet to create his new in flight brochure racks for Bucher Leichtbau AG. Among other key properties, the sheet provides compliance with FAR 25.853 flame and smoke requirements and ABD0031 toxicity limits at 2mm and 3mm.



PECO MANUFACTURING



PECO Manufacturing used an integrated structural design which consolidated parts and eliminated a main frame requirement in order to reduce the footprint of its passenger service unit. ULTEM 9085 resin's improved flow enabled thinner walls, and the result was a 30% smaller unit with considerable weight savings, which provided more headroom to accommodate the new platform design. LEXAN FST9705 resin with integral colors was used for the visual "touch points" of the assembly's light and air movement components.

PILATUS AIRCRAFT LTD.



LEXAN F6000 sheet was specified by Pilatus Aircraft Ltd., a world leading manufacturer of single engine turboprop aircraft and pilot training systems, to create its new state of the art cockpit. The material gives the OEM superior processability vs. thermosets, excellent colorability, dimensional stability and compliance with industry safety requirements.

SEATING

INNOVATIVE AND COMPLIANT: ADVANCEMENTS FOR NEXT GENERATION SEATING

SEATING

SEAT BACK SHELLS

SEATING SUPPORT STRUCTURES

TRAY TABLES AND ARMS

ARM AND FOOT RESTS

CENTER CONSOLES

Seating has long been a focal point for passenger comfort and safety and for cabin aesthetics. At the same time, seating components offer a premiere opportunity to reduce weight without compromising strength, stability and durability. SABIC's focus is here, too, with materials to help OEMs stretch the boundaries of lightweight seating design and performance.

The foam is available in density ranges from 60kg/m³ to 110kg/m³ to accommodate precise application demands. Compared to conventional aramid honeycomb systems, ultralight ULTEM foam offers full FST and OSU compliance, lower moisture absorption, better energy absorption properties, low dielectric loss and easier manufacturing.

ULTEM FOAM

Lower weight systems hold the key for improving aircraft efficiency and performance. SABIC can help unlock your ideas with a material that has the inherent flame, smoke and toxicity performance of ULTEM resin, but at a density up to 30 times lower than the resin itself. ULTEM foam offers designers and OEMs new opportunities to shed weight without sacrificing performance or compliance. It's formed by extruding ULTEM resin into a rigid foam board that is then used as the structural core in multi-layer systems.



Aviation Week magazine recognized lightweight ULTEM foam with its annual Innovation Challenge Award for "representing the best in class, potential game changing innovation."

ULTEM FOAM (XP060) — TYPICAL FOAM PROPERTIES

Physical properties	Density	lbs/ft ³ (kg/m ³)	3.7 (60)
Mechanical properties	Compressive strength	psi (MPa)	100 (0.7)
	Compressive modulus	psi (MPa)	6700 (46)
	Shear strength	psi (MPa)	120 (0.8)
	Shear modulus	psi (MPa)	2800 (14)
Flammability	60s vertical burn	FAR 25.853	Pass
	Smoke density	FAR 25.853	Pass
	Toxicity	BSS or AMD	Pass
	OSU heat release	FAR 25.853	<65/65
	Insulation radiant panel	FAR 25.856	Pass

Note: please visit www.sabic-ip.com for details of properties and a list of various grades.

SEATING

CARBON FIBER FILLED ULTEM RESIN

When it comes to replacing airline grade die-cast aluminum in structural supports, SABIC's 40% carbon fiber -filled ULTEM resin technologies can provide a step up. Their excellent stiffness and flow characteristics allow for thin-walled molded parts that can reduce weight up to 50% while significantly increasing strength. THERMOCOMP EC008PXQ compound can change the way you think about arm and foot rests, tray table arms, and support structures – nearly any application where lightweight, solid support is required.

FLAME-RESISTANT FIBERS AND FABRICS

If every fiber and fabric on an aircraft interior delivered intrinsic flame resistance along with low smoke and toxicity, imagine how safe – and easy – that would be. Advances like SABIC's ULTEM resins can help make it possible. Tough, compliant and easily processed, they can be spun into fibers or converted as a solvent-spun hollow fiber or membrane. Available in staple, multifilament or spun yarn, the new resins feature solid stability at high temperatures, combined with chemical resistance and heat release. Plus, fibers and fabrics made from ULTEM resin can be dyed and show good color stability, even after repeated exposure to UV and washing.

With high-performance, flame-resistant fiber technology from SABIC, you can change the way you think about aircraft interiors and design a new standard of passenger safety and cost-effective compliance.

The ULTEM product line also offers a wide variety of select grades engineered for targeted properties that can meet the specific needs of applications with distinct performance and processing requirements.

ULTEM 1668A sheet meets all current commercial aircraft interior requirements, including OSU heat-release rate below 65/65, FAA smoke and flammability testing, and FRA vertical burn criteria and complies with toxicity standards BSS7239 and ABD0031. ULTEM 1668A sheet also offers aircraft OEMs exceptional impact and heat resistance, modulus and chemical resistance in combination with lightweight, exceptional strength and good surface aesthetics. The product can be thermoformed, pressure formed, twin sheet formed or used in flat or cold-formed applications. Paintable and/or available from SABIC in a range of colors, ULTEM 1668A sheet is finding use in an array of interior aircraft applications, such as passenger service units, first-class and business-class seating and flight deck components, galleys, stow bins and sidewalls.

ULTEM FIBER (2640dtex/1200f) — TYPICAL FIBER PROPERTIES

Mechanical properties	Tensile strength	cN/dtex	2.5
	Tensile modulus	cN/dtex	30
	Elongation at break	%	70
Thermal & FR properties	Glass transition temp.	°C	215
	Shrinkage at 180°C	%	<3
	LOI	%	31
	Low smoke density	Ds(4min)	0.2
Other	Dyability (possible to use a disperse dye like a PET)		
	Thermoplastic (matrix polymer for composite)		

LEXAN SHEET AND RESIN MATERIALS FOR SEATING

With its extremely low heat release and potential for significant weight-out, revolutionary LEXAN XHR 6000 sheet series can deliver superior weight-out of up to 12 percent vs. traditional PVC/PMMA products for better fuel economy while fully complying with FST requirements (FAR 25.853) of major airlines for seating. It can be color-matched in sheet and resin form for color coordinated thermoformed and injection-molded parts. Available in more than 250 colors, and with suede, polished, and a new super low gloss velvet texture which brings low gloss aesthetics after thermoforming, LEXAN XHR sheet can reduce production costs, eliminate paint and withstand punishment in high-abuse seating applications.

Exceptionally tough LEXAN F6000 sheet meets the aircraft industry's demands for high impact strength, excellent resistance to heat, flame and UV, and for outstanding dimensional stability at elevated temperatures. The material is available in custom colors as well as metallic effects for seating applications that require high aesthetics. LEXAN sheet can be easily formed into complex shapes with standard thermoforming equipment. This material offers compliance with FAR 25.853 flame, smoke, heat release and Airbus/Boeing toxicity requirements for seating applications. LEXAN F6000 sheet offers light weight – 1.21 gr./cm³ and can sustain texture retention after forming.

Versatile LEXAN CFR5630 resin is suitable for small opaque parts such as window and seating components.



EADS Sogerma's first and business class seats use SABIC's LEXAN sheet.

SEATING

SEATING CASE STUDIES

C&D ZODIAC

When seeking a material that could help reduce the high cost and extensive time required to develop new thermoformed components, C&D Zodiac chose LEXAN XHR6000 sheet. It can be thermoformed at lower temperatures which means C&D could take advantage of texture in the sheet rather than texturing the mold, while meeting all OEM requirements for flame, smoke, toxicity and heat release. The sheet, which is available in a bright-white and custom colors, offered the benefit of eliminating a secondary paint operation or addition of a cap layer.

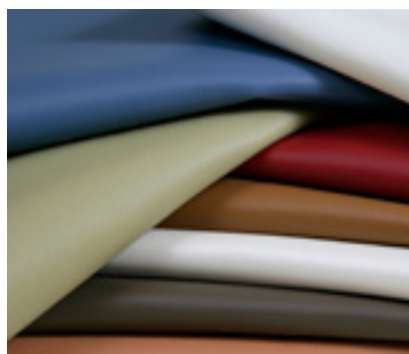


GEVEN S.P.A.

Geven S.p.A., the leading aircraft seating and interior solution provider, chose LEXAN XHR sheet for Caribbean Airlines' "Armonia" interiors, designed by Giugiaro. Challenged to limit seat weight to a maximum 9kg (19.8lbs), the design team selected LEXAN XHR as the best material solution due to its excellent processability, lightweight strength and compliance with stringent flame, smoke, heat release and toxicity requirements.



NATIONAL NONWOVENS



National Nonwovens develops innovative composite solutions for the aerospace industry. A leader in needle punch technology, the company produces lightweight materials found in thermal, acoustic and vibration dampening insulation blankets and makes fire retardant products for seating structures. National Nonwovens uses ULTEM fibers to enhance composite attributes for low smoke density and toxicity, improved flame resistance, low heat release and low moisture absorption. Here, NNW's fire retardant layer has been added to seat coverings.

SICMA AERO SEAT



SICMA Aero Seat, a business unit of ZODIAC AEROSPACE, selected LEXAN XHR sheet for their new business class aircraft seating due to the material's FST and OSU65/65 heat release compliance, excellent processing and beautiful color. The new LEXAN XHR sheet not only provides superior weight-out of up to 12 percent vs. traditional polyvinyl chloride/ acrylic products, but also offer better weight-out for fuel economy while meeting current and future OSU requirements for aircraft seating, cockpit linings, window surrounds, door shrouds, and other interior components.

VAUPELL

Vaupell, a global manufacturer of custom injection molded components and assemblies, partnered with SABIC to develop a rugged tray arm made from engineering thermoplastics that could provide a replacement for aluminum. The team recognized the need to optimize the existing design and decrease stress in critical areas, while better accommodating the molded material properties in the part. The result was a tray arm made from THERMOCOMP compounds that could withstand a peak load of 120 pounds or higher with over 40% weight savings. For an airline with 600 planes, the weight reduction translates into 500,000 gallons of fuel savings per year.



GALLEYS AND MONUMENTS

STRONG, LIGHTWEIGHT SOLUTIONS FOR SERVICE AND COMFORT

GALLEY INSERTS

COUNTERS AND SINKS

MIRRORS

In the tough environment of food distribution and storage equipment, the powerful chemical resistance of new ULTEM 9090 resin can deliver low heat release as well as stand up to the punishment of cleaning agents and high-temperature repeated washings.

ULTEM 1668A sheet offers aircraft OEMs exceptional chemical resistance in combination with lightweight, exceptional strength and good surface aesthetics. The product can be thermoformed, pressure formed, twin sheet formed or used in flat or cold-formed galley applications.

ULTEM AR9300 resin is glass-filled for large parts such as crew communication doors, brackets and other areas where stiffness and strength are required, while maintaining critical FAR and OSU heat release requirements. Its low heat release and increased mechanical performance offer heat stability for galley inserts and oven doors.

Our ULTEM 2300F resin provides food contact compliance, which is typically required for galley insert applications, in addition to complying with stringent flame, smoke and toxicity performance requirements.

TROLLEYS

MONUMENTS

LAVATORY SYSTEMS

LEXAN XHR6000 sheet provides superior weight-out of up to 12 percent vs. traditional PVC/acrylic products, providing better weight-out for fuel economy while meeting current and future OSU requirements for aircraft cockpit linings, beverage carts, door shrouds, and other galley components. LEXAN XHR sheet offers FST and OSU65/65 heat release compliance and excellent processing with a choice of colors.

NORYL™ RESIN

With their low specific gravity and exceptional ability to tailor performance characteristics, NORYL resins offer a lightweight, dimensionally stable alternative to filled or unfilled polyamides, especially for painted or hidden applications where heat release compliance is not required.

Building on a portfolio of weight-out solutions, SABIC has expanded options with new NORYL LS6010 resin, an even lighter material with improved non-halogenated flame retardance and low smoke density, along with the ability to produce pre-colored components. And with its enhanced resistance to cleaning detergents and exceptional hydrolytic stability, it's an excellent material of choice for aircraft catering equipment and kitchens.

GALLEYS AND MONUMENTS CASE STUDIES

LSG SKY CHEFS AND NORDUYN



SABIC offered “one stop shopping” for LSG Sky Chefs, the world’s largest in-flight services provider, and Norduyn, designer and manufacturer of innovative galley and cabin solutions. To help validate the material application, SABIC’s Global Application Technology organization provided performance testing to simulate 10 years of washing cycles, food staining and UV exposure. The result was a new line of ultralight, in-flight trolleys featuring UV resistant ULTEM resin for the extrusion profiles and door latch, and tough NORYL resin for the frame and other components. The trolley received a Crystal Cabin Award for excellence in aircraft interior innovation.

SELL CABIN INTERIOR

ULTEM resin was the material of choice to replace metal in more than 30 parts on Sell Cabin Interior’s New Generation Oven[†]. The material not only saved weight and reduced costs through parts consolidation, it offered the company flexible freedom of design and exceptional aesthetic color matching.



HIDDEN SPACES

IN HIDDEN SPACES, HIGH PERFORMANCE MATERIALS ENHANCE SAFETY AND REDUCE COSTS

WIRING AND FIXATIONS

DUCTING

CONNECTORS

INSULATION

CONDUITS

BRACKETING

Although largely unseen, an aircraft’s “hidden spaces” are home to wiring, ductwork and structural supports that are key to safety and passenger comfort.

EXTEM RESIN

No performance environment can be more challenging for an engineering thermoplastic than extreme high temperatures. When passenger safety is on the line, accept nothing less than the world’s highest heat amorphous thermoplastic polyimide.

Providing an excellent balance of low smoke emission and toxicity, flame retardancy and safety compliance, the unique features of EXTEM resins present an ideal material solution for the most demanding aerospace and aircraft applications.

EXTEM resins deliver industry-leading resistance to extreme heat and chemicals. Their superior strength and stiffness along with great dimensional stability allow thinner wall designs that can reduce part weights and fuel consumption. Plus, they’re inherently flame-retardant and offer excellent processability advantages. And these resins can take the punishment: for example, EXTEM UH1019 resin is the first unfilled thermoplastic to achieve a continuous use temperature rating of up to 260°C according to UL746B with good high-end performance.

For designers who are looking for new ways to replace metal and ceramics, the latest EXTEM UH series offers up to five times greater flex strength and stiffness than unfilled PEEK. And the new Extreme Heat EXTEM UH resin excels at the temperature limits of conventional thermoplastic polyimides, but requires no post-cure or crystallization steps to yield maximum performance.



Pexco used aircraft-compliant materials for its air transfer profile (ULTEM resin) and its lighting lens (LEXAN resin).



LNP™ COMPOUNDS

Drawing from more than 20 base resins and countless high-performance additives, customers can dial in their own formula to meet the demands of virtually any application. By combining advanced materials and technologies with industry-leading know-how, LNP compounds can give designers the freedom they need to innovate and lead the industry to new levels of safety, comfort and performance.

LNP compounds offer material of choice solutions for weight reduction, parts consolidation, elimination of secondary operations and improved performance, durability and aesthetics. Closely tuned engineering attributes can be formulated to meet specific attributes from strength and stiffness to weight, flow properties, chemical and heat

resistance, dimensional stability, shielding, static control, lubricity or even to deliver antimicrobial effects.

For example, THERMOCOMP compounds can enhance nearly any base resin for mechanical properties in even the most demanding heat and chemical environments, and offer a sound solution for metal replacement in tray table arms and structural supports.

ULTEM RESINS

When increased resistance to chemicals is required, ULTEM CRS resins may offer the benefit of increased performance versus our standard ULTEM resins, while meeting flame, smoke and OEM toxicity requirements. Today, these materials are often used in connectors located in hidden spaces.

HIDDEN SPACES CASE STUDY

STRATASYS

Patented Fused Deposition Modeling (FDM) technology from 3D print innovator Stratasys allows design and manufacturing engineers to produce fully functional parts that are ideal for either advanced prototypes or end use – without the cost or lead time of traditional tooling. The direct digital manufacturing process uses SABIC's ULTEM 9085 resin to produce small production runs, building parts layer by layer from the bottom up.



Taylor-Deal Aviation used ULTEM 9085 resin and Fused Deposition Modeling (FDM) technology from 3D print innovator Stratasys to create an air duct offering light weight, flame resistance and toughness.



INNOVATION OPPORTUNITIES

INNOVATION: OPPORTUNITIES TO PUSH THE BOUNDARIES ON DESIGN, WEIGHT-OUT AND SYSTEM COST REDUCTION

SIDEWALLS AND PARTITIONS

FLOORING

CEILING PANELS

GALLEY CARTS

OVERHEAD STORAGE BINS

CARGO LINERS

COMPOSITES, SHEET MATERIALS AND HONEYCOMBS

At the heart of successful aircraft design is the ability to shed weight without sacrificing performance or compliance. SABIC offers the building blocks for innovative composite solutions that allow manufacturers to go beyond the limits of traditional aircraft materials.

By leveraging SABIC's portfolio of advanced products to achieve the optimal balance of light weight, strength, functions, stiffness and safety compliance, designers everywhere can find new ways to shape the next generation of cost-efficient aircraft.

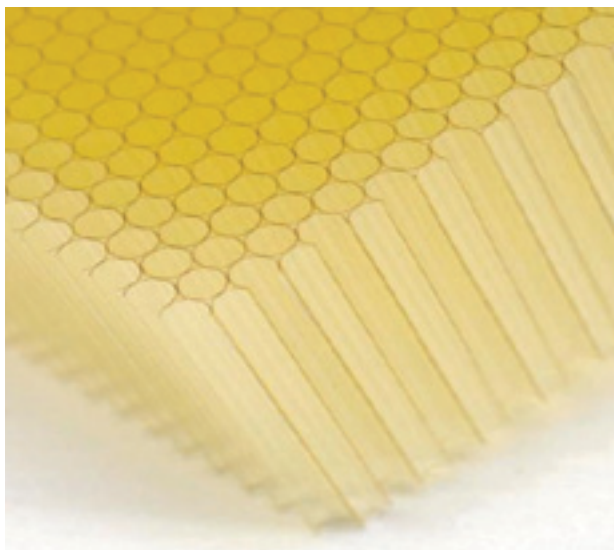
FIBER-REINFORCED CETEX⁺ PEI LAMINATES

Developed specifically for aerospace applications, Cetex continuous fiber-reinforced thermoplastic laminates offer a cost-effective alternative to the labor-intensive, hand lay-up of thermoset prepregs. Developed by TenCate B.V. in the Netherlands, these composite sheets rely on ULTEM resin technology to achieve excellent performance for fire, smoke, toxicity and heat release. But the benefits don't stop there. Cetex PEI laminates weigh up to 30% less than conventional laminates and come in a wide variety of custom colors – from near white to black. That means that applications such as storage bins, flooring and galley carts can be manufactured without secondary paint/powder coating operations. And if a decorative paint is required, the ULTEM-based composite

requires no primer, so customers can realize up to a 75% reduction in paint requirements when using the complete system.

TUBUS BAUER HONEYCOMBS

When Tubus Bauer, a leader in thermoplastic honeycomb-core technology, sought to achieve more stringent FST standards, it partnered with TenCate Advanced Composites B.V. to move beyond traditional polycarbonate and polypropylene with Cetex laminates. SABIC worked with the two companies to develop lightweight honeycomb panels using ULTEM resin at the core, replacing aluminum and thermoset resins to allow the entire panel to be thermoformed. The ultra-lightweight design not only delivered exemplary compliance, it eliminated costly secondary operations.



DIRECT DIGITAL MANUFACTURING AND RAPID PROTOTYPING

ULTEM 9085 resin is a proven performer for Fused Deposition Modeling (FDM) processing. Strong, lightweight, flame-retardant ULTEM 9085 resin helps to address one of the biggest challenges for aircraft OEMs – the ability to produce small volume parts, even those with complex geometries, quickly and cost-effectively. FDM creates three-dimensional parts directly from computer aided design files, layer-by-layer, for use in design verification, prototyping, development and manufacturing.

SILTEM™ RESIN

SILTEM resin offers an alternative to conventional insulation materials by delivering a unique mix of silicone elastomer flexibility, non-halogenated chemistry and low toxicity performance – along with a 30 to 70% reduction in specific gravity. For aircraft designers and manufacturers that means lower bundle weight and more space. For passengers it means a safer, more comfortable ride.



PROPERTIES OF KEY PRODUCTS FOR AIRCRAFT INTERIORS¹

INJECTION MOLDING AND PROFILE EXTRUSION RESINS

TYPICAL PROPERTIES	UNITS	TEST METHOD	ULTEM 1000 RESIN	ULTEM 2300 ⁵ RESIN	ULTEM 9085 RESIN	ULTEM 9075 RESIN	ULTEM 9076 RESIN	ULTEM AR9300 ⁵ RESIN	ULTEM CRS5001 RESIN
Type			Unfilled	30% Glass Fiber	Opaque	Opaque	Opaque	Opaque 30% Glass Fiber	Unfilled improved chem. res.
Mechanical									
Tensile stress	psi (MPa)	ASTM D638	15900 (110)	24400 (168)	12100 (84)	13900 (96)	13900 (96)	22400 (155)	23900 (65)
Tensile modulus	psi (MPa)	ASTM D638	519000 (3580)	1349000 (9300)	498000 (3440)	479000 (3300)	479000 (3300)	1299000 (8960)	419000 (2890)
Tensile strain	%	ASTM D638	60	3	72	85	92	3	60
Flex stress	psi (MPa)	ASTM D790	23900 (165)	32900 (227)	20000 (138)	20900 (144)	20900 (144)	34900 (241)	19900 (137)
Flexural modulus	psi (MPa)	ASTM D790	509000 (3510)	1299000 (8960)	423000 (2920)	469000 (3240)	469000 (3240)	1399000 (9650)	449000 (3100)
Tensile stress	MPa	ISO 527	105	165	88	90	95	165	100
Tensile modulus	MPa	ISO 527	3200	9500	3050	3200	3000	9500	3200
Tensile strain	%	ISO 527	60	2	50	25	50	2	50
Flexural stress	MPa	ISO 178	160	225	90	130	135	225	110
Flexural modulus	MPa	ISO 178	3300	8500	2750	3200	3000	8500	2500
Impact									
Izod impact, notched, 23°C	ft-lb/in (J/m)	ASTM D256	1 (53)	1.6 (85)	2.1 (115)	1.3 (69)	1.4 (74)	2.2 (117)	1.2 (64)
Izod impact, notched, 23°C	kJ/m ²	ISO 180	6		13	7	6		8
Thermal									
HDT, 1.82 MPa	deg. F (°C)	ASTM D648	394 (201)	410 (210)	307 (153)	372 (188)	372 (188)	414 (212)	405 (207)
HDT, 1.8 MPa	°C	ISO 75	190	210	152	185	175	208	200
Physical									
Specific gravity		ASTM D792 ISO 1183	1.27	1.51	1.34	1.3	1.3	1.49	1.28
Melt flow rate	g/10 min	ASTM D1238	9 @ 337C/6.6kgf	5 @ 337C/6.6kgf	8.9 @ 295C/6.6kgf	2.4 @ 295C/6.6kgf	1.4 @ 295C/6.6kgf	4.2 @ 337C/6.6kgf	4.2 @ 337C/6.6kgf
Melt volume rate	cm ³ /10 min	ISO 1133	13 @ 360°C/5.0kg	6 @ 360°C/5.0kg	65 @ 360°C/5.0kg	15 @ 340°C/5.0kg	22 @ 360°C/5.0kg	6 @ 360°C/5.0kg	7 @ 360°C/5.0kg
Processing									
Processing temp. range	deg. F (°C)		660-750 (349-399)	660-750 (349-399)	630-660 (332-349)	660-700 (349-371)	660-700 (349-371)	690-730 (365-388)	660-750 (349-399)
Regulatory									
OSU 65/65, heat release		FAR 25.853	No (<100/100)	No (<100/100)	Yes (<55/55)	Yes (<55/55)	Yes (<55/55)	Yes (<65/65)	No (<100/100)
12 second vertical burn		FAR 25.853	Pass ³	Pass ³	Pass	Pass	Pass	Pass	Pass ³
60 second vertical burn		FAR 25.853	Pass ³	Pass ³	Pass	Pass	Pass	Pass	Pass ³
Smoke density, 4 mins		FAR 25.853	Pass ³	Pass ³	Pass	Pass	Pass	Pass	Pass ³
OEM toxicity		BSS7239 ABD0031 SMP800C	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³

¹ This is not a complete list of products from SABIC. Product properties shown are indicative and not for specification purposes. Please contact your SABIC representative for detailed information such as datasheets and processing guidelines.

² Data not available.

³ Material passes this test, however this material may not be certified from lot to lot without special designation. Please contact your SABIC representative for detailed information.

⁴ Full datasheets available at www.sabic-ip.com

⁵ Glass and carbon filled products available in a range of loadings. Please contact your SABIC representative for more details.

⁶ For translucent grades, please use LEXAN CFR5630D

ULTEM CRS5311 ⁵ RESIN	EXTEM XH1005 RESIN	EXTEM UH1006 RESIN	LNP THERMOCOMP EC006APQ ⁵ COMPOUND	LNP THERMOCOMP EC008PXQ ⁵ COMPOUND	LNP THERMOCOMP LC008EXQ ⁵ COMPOUND	LEXAN CFR5630 ⁶ RESIN	LEXAN FST9705 RESIN	LEXAN ML4539 RESIN	NORYL LS6010 RESIN
30% Glass Fiber Improved Chemical Resistance	Opaque	Opaque	30% ULTEM Carbon Fiber High Modulus	40% ULTEM Carbon Fiber High Modulus	40% Peek Carbon Fiber High Modulus	Opaque & Transparent	Opaque	Opaque & Transparent	Opaque
23900 (165)	14900 (103)	17400 (120)	40700 (281)	41625 (287)	47862 (330)	9800 (68)	10400 (72)	8900 (62)	9200 (64)
1299000 (8960)	496000 (3420)	551000 (3800)	4426000 (30520)	5598000 (38600)	6016000 (41480)	362000 (2500)	379000 (2610)	NA ²	321000 (2220)
3	15	20	1.3	1	1.5	51	102	90	20
33900 (234)	24300 (168)	25300 (175)	50700 (350)	53900 (372)	71300 (492)	15300 (106)	16600 (115)	13100 (91)	14500 (100)
1299000 (8960)	453000 (3130)	510000 (3520)	3814000 (26300)	4728000 (32600)	5105000 (35200)	348000 (2400)	362000 (2500)	324000 (2240)	346000 (2390)
160	101	112	252	247	321	67	76		64
10000	3160	3500	29250	35480	40420	2400	2500		2440
2	6	19	1.1	0.9	1.4	23	109		8.3
210	150	155	332	364	460	103	107		100
8200	2850	3000	23930	30560	33820	2500	2320		2360
2.1 (112)	0.8 (43)	1.4 (75)	1.5 (82)	1.1 (64)	1.5 (82)	1.8 (100)	3.6 (194)	12 (640)	5.6 (300)
	4	9		6		10	16		18
430 (221)	455 (235)	460 (238)	383 (195)	379 (193)	635 (335)	248 (120)	249 (121)	270 (132)	251 (122)
215	225	240				120	117		124
1.51	1.31	1.37	1.39	1.44	1.44	1.19	1.34	1.21	1.11
1.8 @ 337C/6.6kgf	6.0 @ 367C/6.6kgf	10.0 @ 400C/6.6kgf		15 @ 380C/6.6kgf		5.0 @ 300C/1.2kgf	5.0 @ 300C/1.2kgf	9.0 @ 300C/1.2kgf	5.6 @ 280C/5.0kgf
7 @ 360°C/5.0kg						5 @ 300°C/1.2kg	4 @ 300°C/1.2kg		5 @ 280°C/5.0kg
660-750 (349-399)	720-770 (382-410)	750-780 (399-416)	720-750 (382-399)	720-750 (382-399)	720-750 (382-399)	550-590 (288-310)	540-580 (282-304)	560-600 (293-316)	540-580 (282-304)
No (<100/100)	Yes (<45/45)	Yes (<45/45)	Yes (<65/65)	Yes (<65/65)	Yes (<65/65)	No (>100/100)	Yes (<55/55)	No (>100/100)	No (<100/100)
Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass	Pass ³	Pass ³
Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass	Pass ³	Pass ³
Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass	Pass ³	Pass ³
Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³	Pass ³

PROPERTIES OF KEY PRODUCTS FOR AIRCRAFT INTERIORS

EXTRUDED SHEET AND THERMOFORMING PRODUCTS

TYPICAL PROPERTIES	UNITS	TEST METHOD	ULTEM 1668A SHEET	LEXAN XHR6000 SHEET	LEXAN XHR5000 SHEET	LEXAN F6000 SHEET	LEXAN F2000A SHEET
Type			High modulus sheet	Bright white color sheet	White cap-layer over a black base sheet	FR opaque polycarbonate	Uncoated, FR transparent and opal white sheet
Mechanical							
Tensile stress	psi (MPa)	ASTM D638	13100 (90)	10400 (72)	10600 (73)		
Tensile modulus	psi (MPa)	ASTM D638	335000 (2310)	379000 (2610)	348000 (2400)		
Tensile Strain	%	ASTM D638	35	102	100		
Flex stress	psi (MPa)	ASTM D790	20400 (140)	16600 (114)	17500 (120)		
Flexural modulus	psi (MPa)	ASTM D790	460000 (3170)	362000 (2500)	477000 (3290)		
Tensile stress	MPa	ISO 527		>60		>60	>60
Tensile modulus	MPa	ISO 527		2300		2300	2300
Tensile strain	%	ISO 527		80		>100	>100
Flexural stress	MPa	ISO 178		100		90	90
Flexural modulus	MPa	ISO 178		2300		2300	2300
Impact and Tear Strength							
Izod impact, notched, 23°C	ft-lb/in (J/m)	ASTM D256	1.4 (74)	3.6 (192)	NA		
Izod impact, notched, 23°C	kJ/m ²	ISO 180		16		70	70
Tear Strength - Initiation	lbf/mil (N/mm)	ASTM D1004	NA	NA	NA	NA	NA
Tear Strength - Propagation	lbf/mil (N/mm)	ASTM D1922	NA	NA	NA	NA	NA
Thermal							
HDT, 1.82 MPa	deg. F (°C)	ASTM D648	189 (87)	250 (121)			
HDT, 1.8 MPa	°C	ISO 75		117		127	127
Physical							
Specific gravity	g/cm ³	ISO 1183	1.30	1.34	1.34	1.21	1.21
Regulatory							
OSU 65/65, heat release		FAR 25.853	Yes (<55/55)	Yes (<55/55)	Yes (<55/55)	No	No
12 second vertical burn		FAR 25.853		Pass	Pass	Pass	Pass
60 second vertical burn		FAR 25.853		Pass	Pass	Pass	Pass
Smoke density, 4 mins		FAR 25.853		Pass	Pass	Pass	Pass
OEM toxicity		BSS7239 ABD0031 SMP800C		Pass	Pass	Pass	Pass

GLOBAL APPLICATION DEVELOPMENT TECHNOLOGY

In addition to our broad product portfolio, customers can tap SABIC's world-class customer service in the form of outstanding technical support and a culture of application development expertise. Our Global Application Development (GApT) Centers are strategically located in Shanghai, China; Moka, Japan; Bangalore, India; Bergen Op Zoom, The Netherlands; Sungnam City, Korea; and Pittsfield, Mass., USA. The centers are home to experts, new technologies and a wealth of historical data in a wide variety of segments and industries, encompassing design, predictive engineering, processing and part performance.

Centers of Excellence include:

- Thermoplastic composites
- Handheld electronics
- Automotive applications such as glazing and energy management
- Alternative energy
- Synthetic fibers
- Energy storage
- LED
- Fluid engineering

LEXAN 9600 SHEET	LEXAN F2100 SHEET	LEXAN FR60 FILM	LEXAN MRAC SHEET	LEXAN FMR604 SHEET	LEXAN HLG5FRA SHEET	LEXAN JET MIRROR	LEXAN XHRA13 FILM
General purpose, uncoated thin gauge sheet	General purpose thick gauge FR sheet	Transparent FR film	High scratch resistance, transparent coated sheet for flat applications	Transparent coated sheet for curved applications	Transparent coated sheet for flat applications	Mirrorized FR LEXAN polycarbonate	OSJ Compliant Co-Polymer Film
	9500 (66)	10000 (69)	10000 (69)	10000 (69)		9500 (66)	10400 (72)
	230000 (1590)	319000 (2200)	245000 (1690)	240000 (1650)			379000 (2600)
	95		>80	>80		95	102
	15000 (100)		14000 (97)	14000 (97)		13500 (93)	
	340000 (2340)		350000 (2410)	345000 (2380)		370000 (2550)	
>60		>60			>60		>60
2300		2200			2300		2300
>100					>100		80
90					90		
2300					2300		
12 (640)	16 (854)	NA	2.4 (128)	2.4 (128)	11 (600)	2.4 (128)	NA
		NA					NA
NA	NA	1.4 (250)	NA	NA	NA	NA	0.6 (100)
NA	NA	0.09 (16)	NA	NA	NA	NA	0.02 (3.4)
145 (63)	280 (138)	290 (143)	270 (132)	280 (138)		280 (138)	250 (121)
		145			136		
1.25	1.20	1.32	1.20-1.27	1.2-1.28	1.2	1.25	1.34
No	No	Yes (<65/65)	No	No	No	No	Yes (<55/55)
Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
			Pass	Pass	Pass	Pass	Pass

A SABIC COMPANY

Innovative Plastics is a business unit of SABIC. Founded in 1976, SABIC today is the first public, global multinational enterprise headquartered in the Middle East. Its products range from bulk commodity chemicals to highly engineered thermoplastics for demanding applications. It is a leading producer of polycarbonate, polyethylene, polypropylene, glycols, methanol and fertilizers, and polyolefin.

SABIC's businesses are grouped into Chemicals, Performance Chemicals, Polymers, Innovative Plastics, Fertilizers and Metals, representing a vast portfolio of products and services aligned to assist customers with end-to-end solutions anywhere in the world.

From logistics to technology to innovation and support, we're here to help. Our dedicated Technology & Innovation Centers are strategically located – in Saudi Arabia, the Netherlands, Spain, the USA, India, China and Japan – ready to serve our customers and business partners with the resource they need to create lasting competitive advantages in the global marketplace.

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