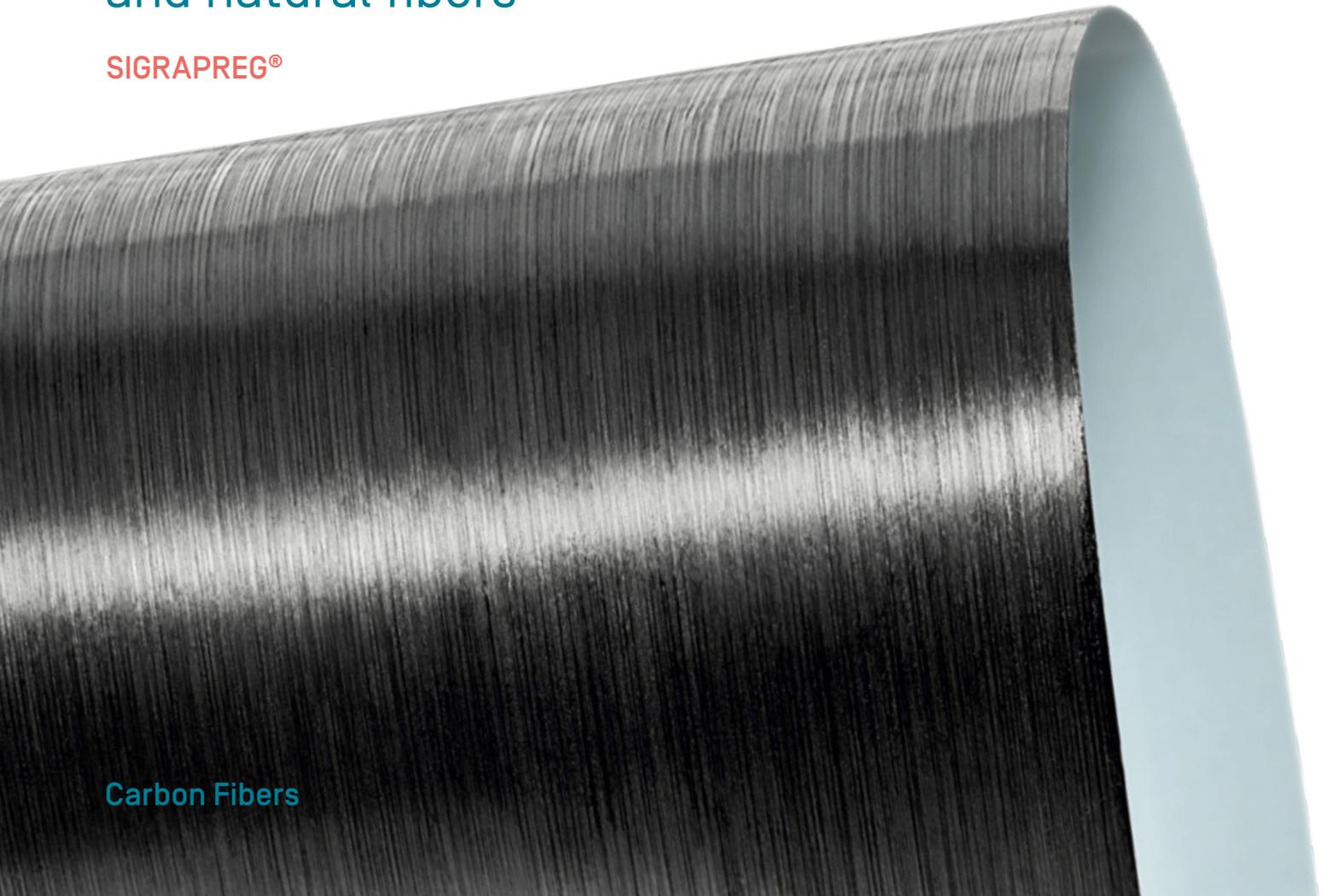




The Simplifiers

Our pre-impregnated materials
made from carbon, glass, aramid
and natural fibers

SIGRAPREG®



Carbon Fibers



SIGRAPREG® snap-cure **Simple. Fast. Cost-efficient.**

SIGRAPREG from SGL Carbon is the brand name for state-of-the-art pre-impregnated reinforcing materials that can be combined with different resin systems, such as our fast-curing snap-cure epoxy resin system we developed in-house. Curing times of between 1.5 and 3 minutes and the possibility of using simple isothermal processes permit very short cycles in automated large-volume production of composite components. In this way, long production runs – like the ones required in the automotive industry – can be produced very simply, rapidly and cost-efficiently in extremely high quality. Smart solutions from SGL Carbon – real simplifiers.



Prepregs based on carbon, glass, aramid and natural fibers

Whether based on woven fabrics, non-crimped textiles or non-wovens – our pre-impregnated materials are proving highly successful in a wide range of applications across numerous industries. With our top-quality products and outstanding expertise in all processing steps, we are able to offer smart solutions with genuine added value for our customers' products and processes.



Market segments of our Business Unit Carbon Fibers

Typical applications

Automotive

- Structural components
- Design components
- Chassis components
- Drive train

Industrial Applications

- Medical technology
- Robotics and automation technology
- Measuring technology and optics
- Machinery manufacture
- Sports & leisure
- Antiballistic technology
- Marine industry

Typical products

- A, B, C pillar reinforcement
- Roof modules
- Trunk lids
- Leaf springs
- Drive shafts

- X-ray patient supports
- Robot arms
- Sensor tubes
- Lifting beams
- Add-on parts for motor sport
- Safety helmets
- Boat hulls

Materials used from SGL Carbon

- SIGRAPREG® unidirectional prepregs
- SIGRAPREG® multiaxial fabric prepregs
- SIGRAPREG® woven fabric prepregs [surface quality]
- SIGRAPREG® non-woven prepregs

- SIGRAPREG® unidirectional prepregs
- SIGRAPREG® multiaxial fabric prepregs
- SIGRAPREG® woven fabric prepregs
- SIGRAPREG® non-woven prepregs
- SIGRAPREG® adhesive films

Simplifying component production by pre-impregnation

Our pre-impregnated materials are ideally suitable for the production of stiff, strong, ultra-lightweight fiber composites as are often required for lightweight parts, high-tech applications, and components subject to extreme stress. From the automotive industry and industrial applications to aerospace and the energy sector, our prepregs have become established worldwide as the preferred material for challenging applications.

In addition to their outstanding mechanical properties, our prepregs make an important contribution to efficient production processes. This is because they save our customers having to carry out the costly processing step of impregnation, which is so critical to quality. This makes component production far simpler and completely dispenses with the need for mixing, storage, and disposal of resin components.



Aerospace

- Structural components
- Interior components

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- Payload fairings
 - Tanks
 - Partition walls
 - Aircraft seats
 - UAV structural components
 - Floor panels
 - Rotor blades

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- SIGRAPREG® unidirectional prepregs
 - SIGRAPREG® woven fabric prepregs
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Energy

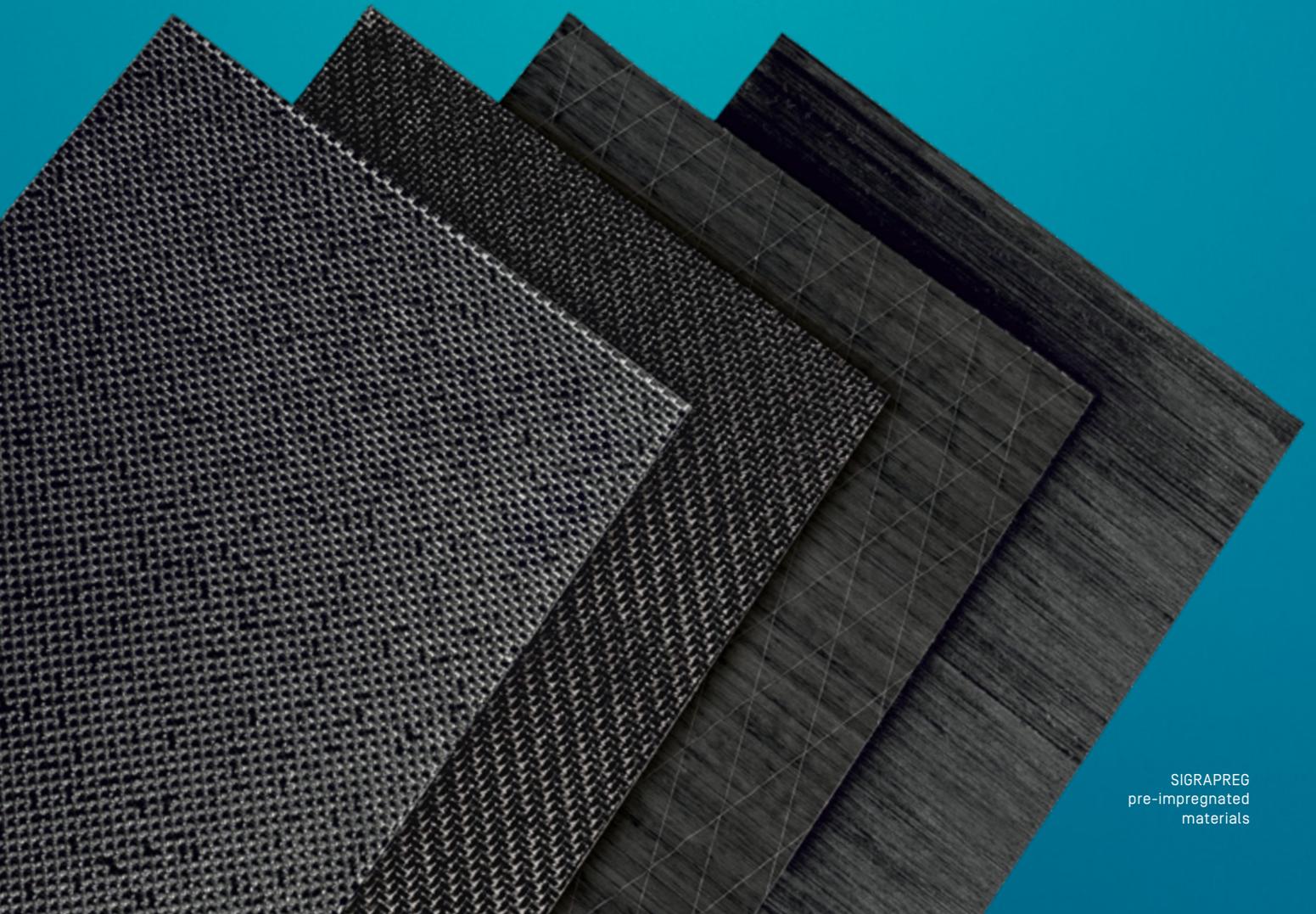
- Renewable energies

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- Spar caps for wind turbines
 - Pipes and risers for oil and gas
 - Electric cables
 - Gas storage tanks

-
- SIGRAPREG® unidirectional prepregs
 - SIGRAPREG® woven fabric prepregs
-

Simple, flexible: our material toolboxes

For fiber-reinforced thermosets used in automotive and aerospace applications, we have developed material toolboxes consisting of pre-impregnated semi-finished products. These toolboxes contain a wide variety of reinforcing materials all based on the same resin system, which is tailored to the specific application. In this way, time and money that would otherwise be spent on qualification processes, tests, and process optimization is reduced. In addition, the various materials have guaranteed compatibility with each other and so can be flexibly combined and processed – for maximum design freedom.



A complete portfolio: prepregs based on woven fabrics, non-crimp textiles and non-wovens

We supply the full range of textile reinforcing materials produced from carbon, glass, natural and aramid fibers and impregnated with various resin systems – from prepregs based on woven fabrics, non-crimp textiles, and non-woven fabrics to adhesive films.

Our pre-impregnated materials have outstanding, reproducible properties and can be tailored perfectly to individual requirements. We use state-of-the-art resin systems that we formulate ourselves in-house. In addition, we can employ various production and processing methods. Prepregs from SGL are ideally suitable for efficient component production and all currently used processes:

Typical processing methods

- Hand lay-up
- Automated placement processes
- Winding processes

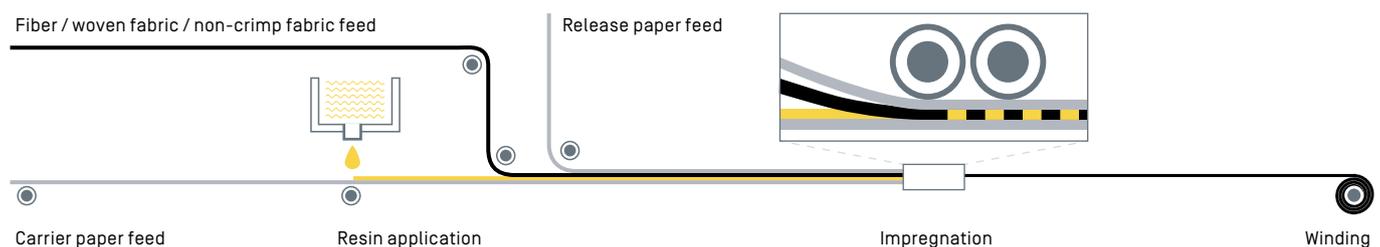
Typical curing processes

- Autoclaving
- Pressing
- Vacuum Bag (OOA)

SIGRAPREG – the basis for components with key advantages:

- Excellent mechanical properties
- Low density
- Low thermal expansion
- Good electrical conductivity
- High fatigue resistance
- High corrosion resistance

Prepreg manufacturing process



High-quality resin systems developed in-house

SIGRAPREG preregs are the result of our consistently customer-focused product development. They unite maximum performance with minimum weight and can be optimally adapted to the requirements of different end uses. We combine high-quality resin systems that we formulate ourselves in-house with state-of-the-art reinforcing materials. Our range comprises a wide variety of resin systems with different glass transition temperatures, curing temperatures and times, viscosity, tack, and storage stability.



↑ Resin application for impregnation

Nomenclature



SIGRAPREG C W95-PL1/1-E321/48%

1	2	3	4	5	6	7
1 Brand name	SIGRAPREG					
2 Material	C = carbon, G = glass, A = aramid, H = hybrid, F = film					
3 Type	W = woven fabric, U = unidirectional, B = biaxial, T = triaxial, Q = quadriaxial, N = non-woven					
4 Fiber areal weight in g/m ²	W = woven fabric, U = unidirectional, B = biaxial, T = triaxial, Q = quadriaxial, N = non-woven					
5 Weave, fixation fiber orientation	woven fabric: PL 1/1 = plain, TW 2/2 = twill 2/2, non-woven: IS = isotropic multiaxial: 0 = 0°, 45 = -45°/+45°					
6 Resin type	NF = not fixed, SO = scrim one-sided, SD = scrim double-sided, ST = stitched					
7 Resin mass content in %	Exxx = epoxy, Pxxx = phenolic					

Individual resin systems for a wide variety of requirements

Resin system	Resin type	T _g [°C]	Curing temperature [°C]	Storage life at 20 °C [days]	Storage life at -18 °C [months]	Tack ¹⁾	Toughened
E500 E501 E502 E503	transparent epoxy	110	80 - 160	70	12	L/M/H	yes
E401	epoxy	120	70 - 140	14	6	M	yes
E400 E402	epoxy	120	80 - 140	40	12	L	no
E310 E311	flame-retardant epoxy	120	80 - 160	14	6	L/M/H	yes
E320 E321 E322 E323	epoxy	120	90 - 140	90	12	M	yes
E302	epoxy	130	70 - 140	14	12	L/M/H	no
E340	epoxy	140	100 - 150	90	12	L/M	no
E704	flame-retardant epoxy	140	140 - 160	14	12	M	yes
E753	flame-retardant epoxy	140	140 - 160	28	12	L	yes
E420	snap-cure epoxy	150	120 - 170	28	12	M	yes
E422	transparent epoxy	150	120 - 170	28	12	M	yes
E800	tooling epoxy	220	80 - 200	14	12	L/M/H	no
P320 P321 P322	phenolic	> 200	100 - 180	180	12	M/H	no
P360	phenolic	> 200	120 - 160	7	6	L/M	no
P500	phenolic	75	150 - 170	28	12	L/M/H	no

Other resin systems are available on request. ¹⁾ L = low, M = medium, H = high

Carbon fiber prepregs based on woven, non-crimp, and non-woven structures

Our pre-impregnated semi-finished products are based on unidirectional, multiaxial, woven, and non-woven fabric structures. We produce unidirectional and multiaxial prepregs with different areal weights and a wide variety of reinforcing fibers. They can be produced with our own fabric structures as well as by direct processing of the reinforcing fibers without additional fixation. The woven fabrics are made in our own weaving facility from 1k, 3k, 6k, 12k or 24k carbon fiber rovings. In hybrid woven fabrics, we also process glass and aramid fibers. For our non-woven prepregs, we use 50k heavy tows with isotropic fiber distribution.



↑ SIGRAPREG carbon fiber woven fabric prepreg

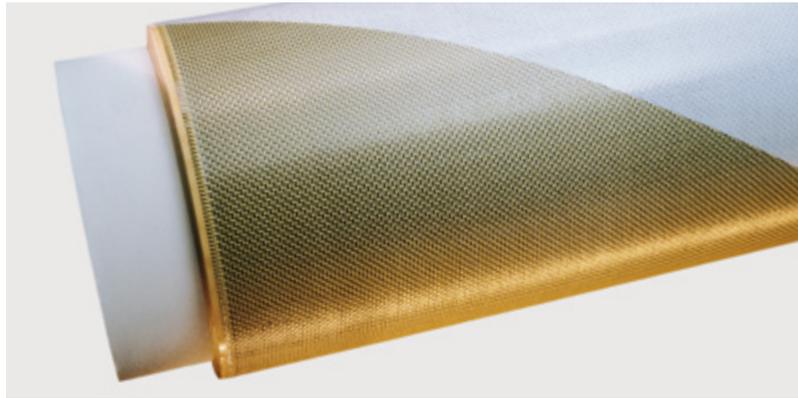
Material data of our SIGRAPREG® carbon fiber prepregs

Material type	Weave/orientation	Areal weight [dry] [g/m ²]	Number of carbon filaments	Resin type	Resin mass content [%]
Unidirectional prepregs					
C U80-0/NF-E704/35%	unidirectional	80	24k	flame-retardant epoxy	35
C U120-0/NF-E704/35%	unidirectional	120	24k	flame-retardant epoxy	35
C U150-0/NF-E340/38%	unidirectional	150	12k	epoxy	38
C U150-0/NF-P360/43%	unidirectional	150	50k	phenolic	43
C U230-0/NF-E320/39%	unidirectional	230	50k	epoxy	39
C U255-0/NF-E322/37%	unidirectional	255	12k	epoxy	37
C U300-0/NF-E420/42%	unidirectional	300	50k	snap-cure epoxy	42
C U450-0/SD-E501/36%	unidirectional	450	12k	transparent epoxy	36
C U600-0/SD-E501/33%	unidirectional	600	50k	transparent epoxy	33
Woven fabric prepregs					
C W95-PL1/1-E323/48%	plain	95	1k	epoxy	48
C W160-PL1/1-E323/50%	plain	160	3k	epoxy	50
C W200-TW2/2-E311/48%	twill 2/2	200	3k	flame-retardant epoxy	48
C W200-TW2/2-E501/48%	twill 2/2	200	3k	transparent epoxy	48
C W200-TW2/2-E323/45%	twill 2/2	200	3k	epoxy	45
C W200-TW2/2-E420/43%	twill 2/2	200	3k	snap-cure epoxy	43
C W245-TW2/2/SQ-E422/45%	twill 2/2	245	3k	transparent epoxy	45
C W245-TW2/2-E323/45%	twill 2/2	245	3k	epoxy	45
C W305-TW2/2-E323/41%	twill 2/2	305	6k	epoxy	41
C W410-TW2/2-E323/42%	twill 2/2	410	6k	epoxy	42
C W665-TW2/2-E323/40%	twill 2/2	665	12k	epoxy	40
C W830-TW2/2-E323/40%	twill 2/2	830	24k	epoxy	40
Multiaxial fabric prepregs					
C B410-45/ST-E323/42%	biaxial ±45	410	50K	epoxy	42
C B410-45/ST-E501/38%	biaxial ±45	410	50K	transparent epoxy	38
C B610-45/ST-E501/36%	biaxial ±45	610	50K	transparent epoxy	36
C B810-45/ST-E501/38%	biaxial ±45	810	50K	transparent epoxy	38
Non-woven prepregs					
C N450-IS/NF-E501/62%	isotropic	450	50K	transparent epoxy	62

Other types available on request.

Prepregs based on glass, aramid and natural fibers

We offer a comprehensive portfolio of high-quality woven fabric prepregs, non-crimp textile prepregs and non-woven prepregs based on glass, aramid and natural fibers. They are suitable for a wide variety of processing technologies, such as hand lamination, automated placement technologies, curing in autoclave-, press- or oven processes and also open up new possibilities in the series production of sustainable fiber composite components.



↑ SIGRAPREG carbon-aramid hybrid prepreg

Material data of our SIGRAPREG® prepregs

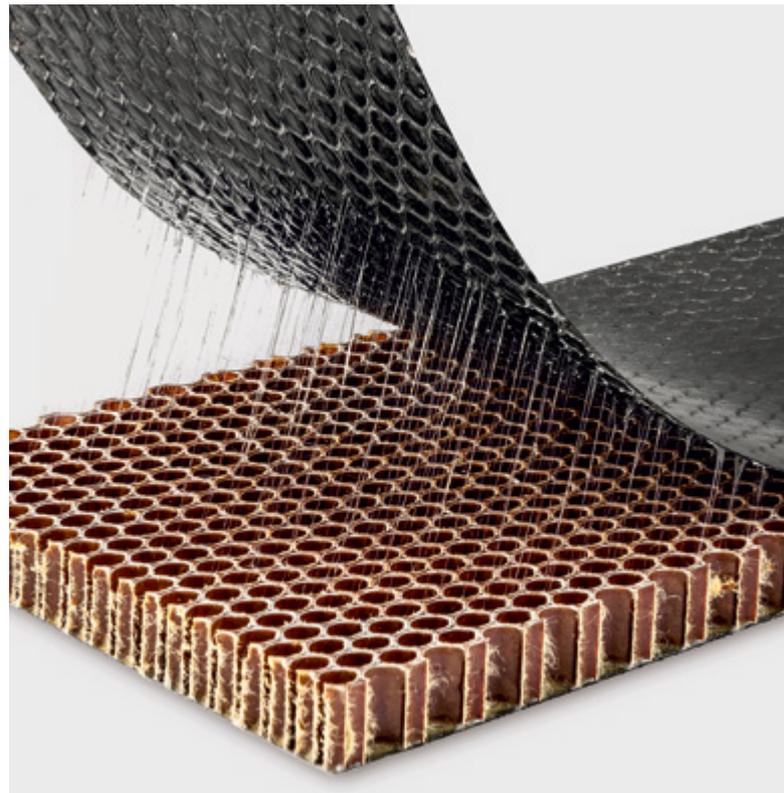
Material type	Weave/orientation	Areal weight (dry) [g/m ²]	Resin type	Resin mass content [%]
Glass fiber prepregs				
G U150-0/NF-E701/40%	unidirectional	150	flame-retardant epoxy	40
G U250-0/SO-E310/35%	unidirectional	250	flame-retardant epoxy	35
G U300-0/NF-E320/35%	unidirectional	300	epoxy	35
G W25-PL1/1-E320/86%	plain	25	epoxy	86
G W280-TW2/2-E323/37%	twill 2/2	280	epoxy	37
G W290-PL1/1-E310/45%	plain	290	flame-retardant epoxy	45
G W296-HS1/7-E310/37%	satın 1/7	296	flame-retardant epoxy	37
G W430-PL1/1-E310/42%	plain	430	flame-retardant epoxy	42
G W580-TW2/2-E323/35%	twill 2/2	580	epoxy	35
Aramid prepregs				
A W170-TW2/2-E320/50%	twill 2/2	170	epoxy	50
A W173-PL1/1/LT-E310/71%	plain	173	flame-retardant epoxy	71
A W173-PL1/1-E310/42%	plain	173	flame-retardant epoxy	42
A W410-TW2/2-P510/24%	twill 2/2	410	phenolic	24
A W460-PL1/1/LT-E310/55%	plain	460	flame-retardant epoxy	55
Carbon-aramid hybrid prepregs				
H W170-PL1/1-E320/45%	plain	170	epoxy	45
H W215-TW2/2-E320/45%	twill 2/2	215	epoxy	45
Natural fiber prepregs (flax fibers)				
H W300-TW2/2-E422/50%	twill 2/2	300	transparent epoxy	50
H B350-45/ST-E422/56%	biaxial ±45	350	transparent epoxy	56

Other types available on request.

Adhesive films based on our resin systems

Our SIGRAPREG adhesive films are thin resin films, e.g. made from epoxy or phenolic resin systems. They ensure good adhesion between our prepregs and various core materials such as honeycombs, metals, and foams.

The adhesive film formulations are specially matched to our prepreg resin systems to ensure optimum compatibility. In this way, sandwich and hybrid materials for a wide variety of applications, for example in the aerospace and automotive sectors, can be produced even more efficiently.



↑ SIGRAPREG adhesive film for bonding prepregs to honeycombs

Material data of our SIGRAPREG® adhesive films

Material type	T _g [°C]	Curing temperature [°C]	Areal weight [g/m ²]	Resin type	Resin mass content [%]	Carrier material	Notes
F 147-E322/100%	120	90 – 140	147	epoxy	100		especially recommended for industrial applications
F 250-E401/100%	120	70 – 140	250	epoxy	100		especially recommended for marine applications
F 50-E720/100%	140	140 – 160	50	epoxy	100		especially recommended for aerospace applications
H N30-E310/88%	120	80 – 160	130	epoxy	88	polyester non-woven	
H N30-P360/80%	> 200	120 – 150	150	phenolic	80	polyester non-woven	

Other types available on request.

Successful together

What matters to us as solution providers is added value for our customers. So we not only offer first-class materials but also the opportunity to develop components and systems together.

With a broad range of pre-impregnated semi-finished products, we supply the perfect basis for efficient, cost-optimized serial production of fiber composites. In addition, we produce material systems individually tailored to the special processes and products of our customers.



Efficiency through application-optimized solutions

Lightweight construction with SIGRAPREG Prepregs
Exceptional efficiency starts with the right material. For example, with SIGRAPREG Prepregs based on our SIGRAFIL 50k carbon fibers. With their outstanding properties, our 50k heavy tows lay the foundation for cost-effective production of fiber composite components. In combination with the right resin system, the result is a high-performance material that makes lightweight construction simple and efficient.

With our many different processing technologies, we supply solutions perfectly matched to your requirements, application, and technical conditions: precisely tailored products for the development and production of competitive lightweight design innovations.

Smart Solutions

Be it materials, components or production processes, we put our customers first. With our in-depth material, engineering, and application know-how, we develop customized, reliable and high-quality solutions for our customers.

The following examples show a selection of our unique product range.

Mobility

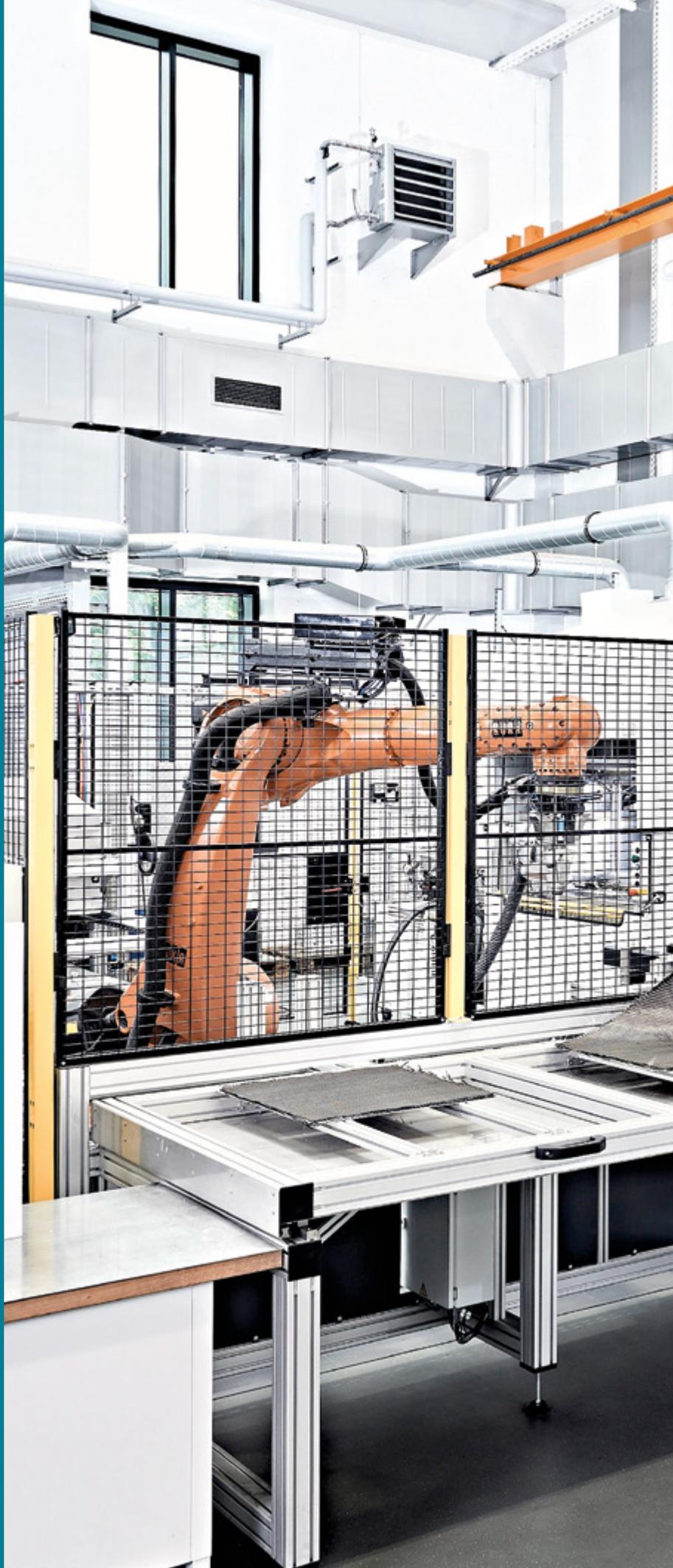
- Lightweight components and structural parts based on fiber-reinforced composites for automotive and aerospace manufacture
- Graphite anode material for lithium-ion batteries in electric vehicles
- Carbon-ceramic brake disks for sports cars and luxury sedans

Energy

- High-temperature solutions based on specialty graphites and fiber materials for the photovoltaic industry
- Carbon fiber materials for rotor blades
- Gas diffusion layers for fuel cells
- Systems for more efficient heat exchange and heat recovery
- Carbon fibers for pressurized gas containers

Digitization

- Carbon, graphite, and CFC components for polysilicon and monocrystal pulling in the semiconductor industry
- High precision, coated graphite carriers for the production of LEDs



SGL Carbon

We are a global leader in the development and manufacture of carbon-based solutions. Our materials and products made from specialty graphite, carbon fibers and composites serve many industries that are shaping the trends of the future: climate friendly mobility, semiconductor technology, LED, solar and wind energy, and the manufacture of lithium-ion batteries.

We are driven to grow with products and technologies that benefit society and reduce environmental and climate impacts.

Together with our customers, we develop intelligent and sustainable solutions that contribute to a smarter world.



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