Broad Base. Best Solutions.

SGL GROUP
THE CARBON COMPANY

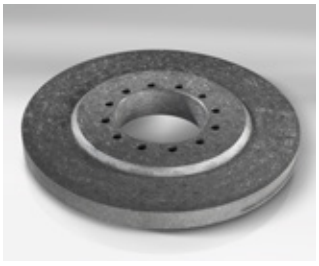
SIGRASIC®

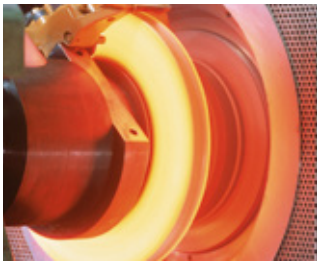
Carbon fiber-reinforced silicon carbide components

At a glance

SIGRASIC products derive their extraordinary properties from carbon fiber-reinforced silicon carbide (C/SiC) – a composite material that combines carbon fibers within a ceramic matrix to maximize the material properties.

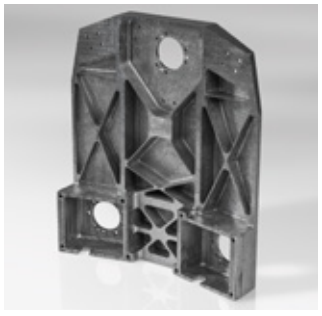
- Hard and ductile instead of being brittle
- High resistance against most corrosive and abrasive media
- Near-net shape processing by in-situ joining
- Adjustable properties to meet specific customer requirements
- High thermal-mechanical fatigue and high thermal shock resistance





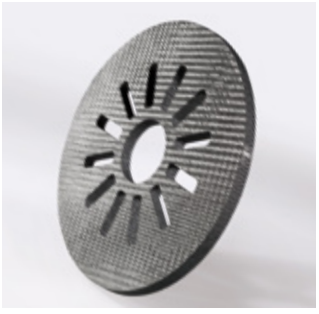
- High heat resistance – up to 1200 °C
- **Technology established within automotive serial production of brake disks**

Application examples for our C/SiC



↑ NASA sensor carrier; designed for low weight, high precision and high stiffness

↑ Pump impeller for highly corrosive and abrasive media

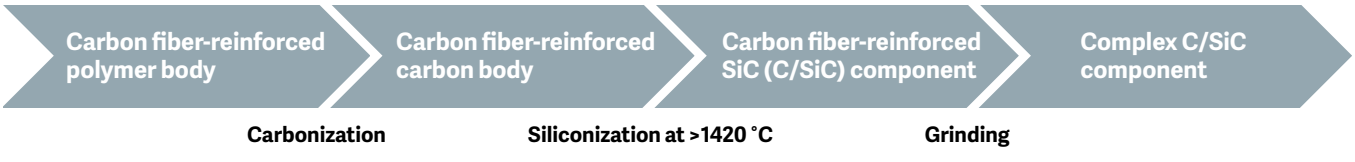


↑ Clutch disk for high-performance serial cars with excellent wear and strength properties

↑ Ballistic protection with complex shaped designs and high hardness

Manufacturing route

C/SiC is manufactured by infiltrating carbon fiber-reinforced carbon body with silicon. Due to near-net-shape processing, complex machining can be performed cost-effectively early in the process. Final ceramic grinding can be used locally when tight tolerances are required. By suitable adjustment of the material and process parameters, the product characteristics can be matched to the intended use of the SIGRASIC component.

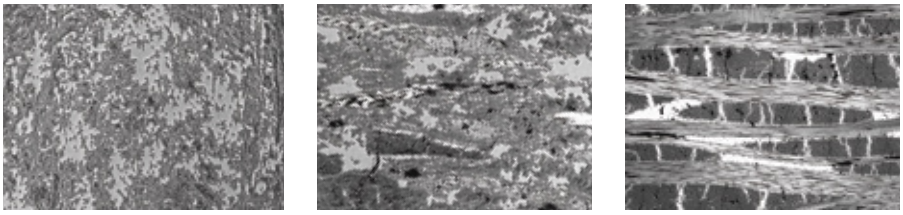


Material data of SIGRASIC® and microstructure of different C/SiC base materials

Typical properties	Units	Felt	Short fibers	Woven fabrics
Density	g/cm³	2.7 – 3.0	2.1 – 2.6	1.8 – 2.2
Bending strength	MPa	130 – 350	50 – 90	150 – 230
Young's modulus	GPa	150 – 330	30 – 60	50 – 80
Elongation at break	%	0.01 – 0.05	0.3 – 0.5	0.4 – 0.6
Thermal conductivity (20 °C)	W/(mK)	110 – 160	20 – 60	13 – 20
Thermal expansion (20 – 200 °C)	µm/(mK)	2.9 – 3.5	1.8 – 2.3	0.3 – 0.5
Temperature resistance*	°C	1400	1400	1400

* in non-oxidating environments

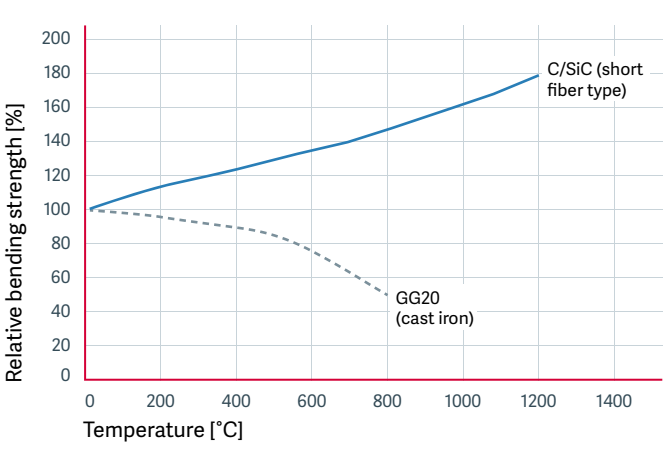
- Technical properties and adjustability of base materials are customizable for individual purposes
- Base materials can be designed with the relevant content and type of carbon fibers



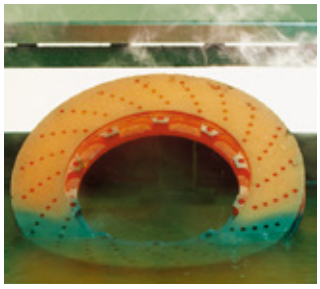
Matrix-dominated **Fiber-dominated**

Unique bending behavior and non-brittleness – uncommon properties for a ceramic material

Relative bending strength versus temperature



↑ Due to its unique material structure, our C/SiC is able to withstand severe multi-hit without breaking



↑ C/SiC is highly suitable for applications with extreme thermal shock requirements

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