MATERIAL DATASHEET

Issued: 02/2024

Silicon Carbide Grades

Typical Properties

Composition		Oxide Bonded (OSiC)	Silicon Infiltrated (SiSiC / RbSiC)	Fine Nitride Bonded (NSiC)	Coarse Nitride Bonded (NSiC)	Recrystalised (RSiC)	Sintered (SSiC)
SiC	%	>85	>90	75	70	>99	>99
Si (metal)	%	-	10	-	-	-	-
Si_3N_4	%	-	-	25	20	-	-
SiO_2	%	10	-	-	-	-	-
Property							
Max Service Temperature	°C (°F)	1400 (2550)	1380 (2500)	1450 (2650)	1450 (2650)	1650 (3000)	1600 (2900)
Bulk Density	g/cm^3	2.7	3.1	2.8	2.7	2.7	3.1
Open Porosity	%	8	<0.5	13	15	15	<0.5
Modulus of Rupture (room Temp)	MPa	30	250	160	35	90	400
Thermal Conductivity	W/mK	15	45	15	15	25	70
Thermal Expansion (20-1000°C)	$x10^{-6}/K$	4.5	4.5	4.7	4.7	4.8	4.0
Thermal Shock Resistance		★★★★	★★★	★★	★★★★	★★★	★★

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General Guidance

Silicon carbide is a chemical compound containing silicon and carbon atoms bound very strongly together. It is extremely rare in nature but has been mass-produced since 1893 (when it was known as carborundum). The base of all IPS silicon carbide (SiC) products is refractory grade silicon carbide, produced in large electrical resistance furnaces at approximately 2400°C from a mixture of silicon, carbon, salt, and sawdust. Silicon carbide is the material of choice for firing and heat-treatment processes working above 1300°C due to the unique blend of properties: -

- **High temperatures** – pure silicon carbide is extremely resistant to high temperatures, remaining solid until about 2700°C (when it starts to sublime to a gas). Kiln furniture materials retain good strength in higher temperature applications working between 1300°C and 1650°C.
- **Thermal cracking** – the low thermal expansion of silicon carbide minimises the thermal stresses generated in an item when heated or cooled, reducing the risk of thermal cracking. As a guide, heating / cooling rates up to 5°C per minute can be used with careful product design.
- **Strength** – Silicon carbide materials have good to excellent cold strengths and retain these good strengths at higher temperatures. This allows the use of much thinner kiln furniture designs, reducing the weight of refractories to minimise energy consumption.
- **Long life** – the high refractoriness of silicon carbide materials means that almost no creep (hot-bending) takes place at working temperatures. Kiln furniture items can have a service life of over 10 years (with careful handling).

Oxide bonded SiC	A lower cost silicon carbide with a great balance between cost and performance. The coarser grain-size of this material makes it most suitable for the thicker batts / shelves used for larger items of ware (in situations where 'rough handling' may occur).
Silicon Infiltrated	One of the strongest materials for kiln furniture; it is mainly used for horizonal support beams carrying high loads.
Fine NSiC	Typically used for thin batts / shelves and crank supports used in the tableware industry.
Coarse NSiC	Supplied as thicker blocks and tiles, primarily for tank linings in the aluminium refining industry.
Recrystalised SiC	Our highest temperature material. Often used for thin tiles above 1450°C, and for complex-shaped posts and props.
Sintered SiC	Mainly used for engineering applications requiring very high strength; can also be used for high temperature applications.

Kiln furniture products can absorb water during their manufacture, transportation, or storage. Wet products may crack if exposed to temperatures of more than 100°C (210°F) as the absorbed water will create uneven rates of heating across the product. Due to this: -

ALL KILN FURNITURE PRODUCTS MUST BE DRIED BEFORE USE.