SILICON CARBIDE SIC

Silicon Carbide, sometimes mistakenly referred to by the trade name Carborundum, is used due to its properties of high hardness (Mohs hardness > 9), wear resistance, its chemical inertness, high thermal conductivity, abrasion resistance, low coefficient of thermal expansion, thermal shock resistance, and strength at high temperature ranges. Silicon Carbide also has the resistivity necessary to perform as a semiconductor material. Because of these properties, Silicon Carbide is used in a wide range of applications and industries.

Silicon Carbide is produced by heating silica sand and a carbon source, typically petroleum coke, to high temperatures in a large, open “Acheson” furnace. The result of this high temperature process is the crystalline formation of Silicon Carbide grains, of both Green and Black coloring. The color difference is due to the purity of the silicon carbide. Green SiC coloring is a result of less impurities than the Black SiC.

TYPICAL APPLICATIONS

Abrasives	Body Armor	Grinding
Sintered Parts	Vehicle Armor	Milling
Hot-pressed Parts	Heat Transfer	Lapping
Reaction Bonded Parts	High Temp Sensors	
Metal Matrix Composites	Ceramic Wear Parts	
Wire-saw	Refractory	

TYPICAL PROPERTIES

- High Hardness
- Chemical Inertness
- High Thermal Conductivity
- Abrasion / Wear Resistance
- Low Coefficient of Thermal Expansion
- Thermal Shock Resistance
- Strength at High Temperature Ranges
- Electrical Conductivity

PANADYNE ISO 9001:2008 QSR-976

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SILICON CARBIDE TYPICAL ANALYSIS

PROPERTIES	UNITS	TEST	VALUE
Physical			
Chemical Formula	-	-	α-SiC
Density, ρ	g/cm^3	ASTM C20	3.21
Color	-	-	dark gray
Crystal Structure	-	-	hexagonal
Water Absorption	% @R.T.	ASTM C373	0.0
Hardness	Mohs	-	9 - 10
Hardness	knoop (kg/mm^2)	Knoop 100g	2800
Mechanical			
Compressive Strength	MPa @ R.T.	ASTM C773	1725 - 2500
Tensile Strength	MPa @ R.T.	ACMA Test #4	310
Modulus of Elasticity (Young's Modulus)	GPa	ASTM C848	476
Flexural Strength (MOR)	MPa @ R.T.	ASTM F417	324
Poisson's Ratio, υ		ASTM C818	0.19
Fracture Toughness, K_{Ic}	MPa x $m^{1/2}$	Notched Beam Test	4.0
Thermal			
Max. Use Temperature (* denotes inert atm.)	°C	No load cond.	1400
Thermal Shock Resistance	ΔT (°C)	Quenching	350 - 500
Thermal Conductivity	W/m-K @ R.T.	ASTM C408	41
Coefficient of Linear Thermal Expansion, α_l	µm/m-°C (~25°C through ±1000°C)	ASTM C372	5.12
Specific Heat, c_p	cal/g-°C @ R.T.	ASTM C351	0.15
Electrical			
Dielectric Constant	1MHz @ R.T.	ASTM D150	10.2
Dielectric Strength	kV/mm	ASTM D116	-
Electrical Resistivity	Ωcm @ R.T.	ASTM D1829	10^8

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