FREEWILL MATERIAL TECHNICAL DATASHEET

Silicon Carbide (SiC)

For heat, severe wear, thermal shock and chemically aggressive service.

Best suited for: Extreme wear, high temperature, thermal shock, corrosive media, kiln systems and semiconductor process parts.

Engineering Positioning

Silicon Carbide is a high-performance ceramic for operating conditions where metals, polymers and many conventional ceramics lose shape, corrode or wear too quickly. Its value is strongest when the customer is paying for unplanned shutdowns, frequent part replacement or unstable high-temperature performance.

Typical Material Properties

Property	Typical engineering reference
Typical service temperature	1350-1600 C, grade and atmosphere dependent
Hardness	22-28 GPa typical
Flexural strength	350-450 MPa typical
Thermal conductivity	90-200 W/m-K, grade dependent
Thermal expansion	4.0-4.5 x 10^-6/K
Key behavior	High hardness, high thermal conductivity, excellent wear and corrosion resistance

Values are typical reference ranges. Final data depends on grade, forming route, sintering process, geometry and test method.

Practical Application Scenarios

- Mechanical seal rings, pump sleeves, nozzles and wear liners in abrasive or corrosive fluids.
- Kiln furniture, beams, rollers, radiant tubes and high-temperature support structures.
- Semiconductor process carriers, SiC-coated components and thermal process parts.
- Desulfurization, chemical processing and high-velocity particle-wear environments.

Selection Notes for Engineers

- Choose RBSIC, RSIC or SSIC based on strength, porosity, chemical exposure, tolerance and cost target.
- Confirm the working atmosphere, thermal cycle rate and whether the component is exposed to alkali, oxidizing or reducing conditions.
- For seal faces and sliding components, specify mating material, medium, pressure, speed and surface finish requirement.

Silicon Carbide (SiC) - Cost and Application Review

The lowest unit price is not always the lowest operating cost. For severe-duty ceramic components, cost should be evaluated by service life, downtime, contamination risk, replacement labor and process stability.

Example Lifecycle Cost-Saving Model

Item	Illustrative scenario
Current solution	Metal nozzle replaced every 4 weeks, 13 changes/year
SiC scenario	SiC nozzle replaced every 16 weeks, 3 changes/year
Simple model	Part cost: USD 180 metal vs. USD 420 SiC; downtime cost: USD 500/change
Estimated annual impact	USD 8,840 to USD 2,760, about 69% lower lifecycle cost in this example

This model is illustrative, not a guaranteed saving. Actual savings depend on operating conditions, design, installation, maintenance behavior and process value per hour.

Recommended Information to Share for Quotation

- Drawing, sketch, sample photo or target geometry.
- Working temperature, thermal cycle rate and atmosphere.
- Chemical medium, abrasive particles, pressure, speed and load.
- Current material, failure mode and expected service life.
- Required tolerance, surface finish, purity, quantity and delivery target.

Why Work with Freewill Material

Material selection	Recommendation based on operating conditions, not only material names.
Custom manufacturing	Ceramic and refractory components from drawings, samples or application requirements.
Technical communication	Support for engineers and procurement teams during sample, testing and volume production.
Global customer focus	English technical content, downloadable datasheets and application-oriented inquiry support.

Contact

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Ask for an expert material recommendation and include your working condition details for faster review.