Entegris

SUPERSiC®-GS AND -TS BEAMLINE MATERIALS

Longer life, lower particles, higher purity, refurbishable

Overview

Entegris' SUPERSiC®-GS and -TS materials consist of a silicon carbide (SiC) surface layer intermixed with graphite and have an underlying graphite core. This creates a composite material that resists oxidation and resists delamination when thermally shocked (SiC will crack or shatter when suddenly cooled from a high temperature).

Using a propriety chemical vapor conversion (CVC) process, Entegris' process *partially* converts the outer layers of graphite to SiC. This converts the graphite incompletely, without creating a distinct SiC layer that could delaminate under stress, resulting in a composite SiC shell. The SiC shell conversion combines the best attributes of SiC and graphite in a single monolithic component that has advantages over either material separately, and leapfrogs past SiC coated products.

Entegris' SiC shell conversion provides the lowest cost of ownership over graphite and other ceramic materials due to higher performance and reduced cost.

Originally intended for use in ion implant tools for which it is currently in testing, the material is also finding uses in aerospace applications where high resistance to oxidation at very high temperatures for short periods of time (minutes) is needed.

Attributes

- Increased thermal shock resistance compared to solid SiC
- Initial plasma erosion resistance and physical abrasion resistance similar to SiC
- Ability to hold a tighter tolerance with an as-converted artifact
- Higher electrical conductivity than CVD SiC coated graphite
- SiC shell is thicker than conventional CVD coatings over graphite
- Lower cost due to elimination of post conversion machining
- CTE of SiC shell matches silicon and nitride depositions
- SiC shell much harder than graphite underlayer, increasing component life through reusability

Typical Material Properties

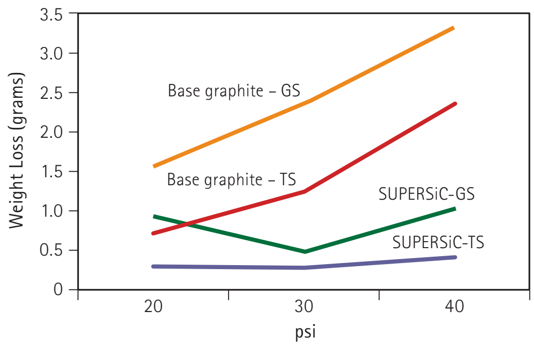
Property	SUPERSiC-GS	SUPERSiC-TS
Bulk density:*	2.18 g/cm³ (0.079 lb/in³)	2.07 g/cm³ (0.075 lb/in³)
Total impurity level:	<10 ppm	
Flexural strength:**	69 MPa (10,000 psi)	96 MPa (14,000 psi)
Thermal conductivity K:	88 W/m-K (51 Btu-ft/hr/ft²°F)	130 W/m-K (75 Btu-ft/hr/ft²°F)
Electrical resistivity:	3050 µΩ-cm (1200 µΩ-in)	2080 µΩ-cm (820 µΩ-in)
Average CTE from 250–750°C:	4.5 10^{-6}/K (2.5 10^{-6}/°F)	

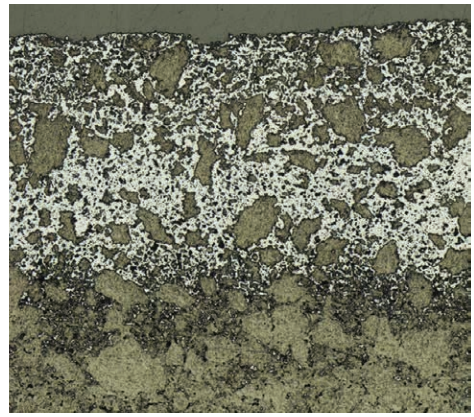
**Based on SA/V ratio of 12.5.*
***4 pt based on 0.25" × 0.5" × 4" MOR bar.*

Performance Data

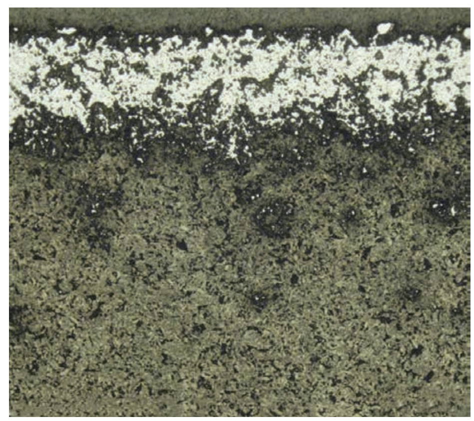
SiC grit blast at 20, 30 and 40 psi air pressure used to test abrasion resistance of shell SiC compared to base graphite, showing substantial reduction in erosion.

Erosion Resistance of SiC Shell vs. Base Graphite





Photomicrograph of SUPERSiC-GS showing mixed phase of SiC and graphite in the microstructure.



Photomicrograph of SUPERSiC-TS showing mixed phase of SiC and graphite in the microstructure.

Typical Purity of SUPERSiC Silicon Carbide

LA-ICP-MS ELEMENTAL DATA ANALYSIS

Element		Element	
B	0.04 ppm	Cr	0.20 ppm
Na	0.10 ppm	Mn	0.12 ppm
Mg	0.10 ppm	Fe	0.30 ppm
Al	0.20 ppm	Co	0.00 ppm
P	0.35 ppm	Ni	0.30 ppm
S	1.05 ppm	Cu	0.01 ppm
K	0.30 ppm	Zn	0.01 ppm
Ca	0.30 ppm	Zr	0.30 ppm
Ti	0.08 ppm	Mo	0.06 ppm
V	0.17 ppm		

For More Information

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