

# SUPERSiC® Materials

## Silicon carbide

Entegris' line of high-purity silicon carbide products is marketed under the SUPERSiC® trade name. SUPERSiC is a unique silicon carbide material created and customized precisely for specific applications.

Entegris provides an array of infiltration materials, cleaning options, and coatings to create the material specifications that meet precise needs.

### SUPERSiC MATERIALS

Entegris' unique conversion process produces the highest quality silicon carbide products available on the market today. This process starts with graphite material specially designed and manufactured for use as the precursor in the conversion process.

Near-net shaped parts are machined in graphite, purified, and subjected to a proprietary conversion process which substitutes pure silicon atoms for carbon atoms. During conversion Entegris has the ability to fuse parts so that they enter the furnace as an assembly of individual pieces and exit as a monolithic unit, with properties indistinguishable from those of a part originally made from one piece. This is done without the use of adhesives or other bonding agents. This conversion bonding process enables the creation of extremely complex, lightweight structures for aerospace optics such as spaceflight worthy, closed-back, off-axis, aspherical mirrors for satellite systems, or high-purity wafer carriers for the semiconductor and photovoltaic industries. These material and process advantages have placed Entegris on the forefront of silicon carbide component development.

#### SUPERSiC

SUPERSiC is the base SiC of Entegris, converted graphite.

#### SUPERSiC-3C

SUPERSiC-3C is SUPERSiC that has been coated with a 75 µm Chemical Vapor Deposition (CVD) SiC coating, which seals the surface. This material is ideal for high-temperature deposition and CVD applications.



#### SUPERSiC-3CX

SUPERSiC-3CX is SUPERSiC that has been coated twice with a 75 µm CVD SiC coating, which seals the surface. This material is ideal for high-temperature anneal processes.

#### SUPERSiC-Si

SUPERSiC-Si is SUPERSiC that has been infiltrated with high-purity silicon. This material is ideal for etch systems.

#### SUPERSiC-Si-3C

SUPERSiC-Si-3C is SUPERSiC that has been infiltrated with silicon and then coated with a 75 µm CVD SiC coating, sealing off the porosity. This material is ideal for high-temperature vacuum CVD systems.

#### SUPERSiC-Si-8C

SUPERSiC-Si-8C is SUPERSiC that has been infiltrated with silicon and then coated with a 200 µm CVD SiC coating. This material is ideal for optical and lithography components.

#### SUPERSiC-SP

SUPERSiC-SP is the newest grade in Entegris' family of silicon carbide materials. The product improves on the mechanical properties of SUPERSiC-Si by changing the densification material from silicon to silicon carbide.\* The result is a material that is stronger in flex and tensile load, with improved resistance to aggressive cleaning used in semiconductor processes.

*\*Some trace amounts of free silicon will remain.*

## TYPICAL MATERIAL PROPERTIES

PROPERTY	SUPERSiC	SUPERSiC -3C (-3CX)	SUPERSiC -Si (-4S)	SUPERSiC-Si -3C (-8C)	SUPERSiC -SP
<b>Apparent density</b>	3.13 g/cm <sup>3</sup> (0.113 lb/in <sup>3</sup> )	3.15 g/cm <sup>3</sup> (0.114 lb/in <sup>3</sup> )	3.01 g/cm <sup>3</sup> (0.109 lb/in <sup>3</sup> )	3.03 g/cm <sup>3</sup> (0.110 lb/in <sup>3</sup> )	3.04 g/cm <sup>3</sup> (0.110 lb/in <sup>3</sup> )
<b>Bulk density</b>	2.53 g/cm <sup>3</sup> (0.092 lb/in <sup>3</sup> )	2.55 g/cm <sup>3</sup> (0.092 lb/in <sup>3</sup> )	2.93 g/cm <sup>3</sup> (0.106 lb/in <sup>3</sup> )	2.95 g/cm <sup>3</sup> (0.107 lb/in <sup>3</sup> )	3.00 g/cm <sup>3</sup> (0.109 lb/in <sup>3</sup> )
<b>Total porosity % of volume</b>	20%	20%*	4%	4%*	5%
<b>Open porosity % of total</b>	19%	0%**	1%	0%**	1%
<b>Total impurity level</b>	<10 ppm				
<b>Flexural strength</b>	155 MPa (22,400 psi)	155 MPa (22,400 psi)	192 MPa (27,900 psi)	192 MPa (27,900 psi)	220 MPa (31,900 psi)
<b>Tensile strength</b>	129 MPa (18,700 psi)	129 MPa (18,700 psi)	124 MPa (17,940 psi)	124 MPa (17,940 psi)	162 MPa (23,510 psi)
<b>Elastic modulus</b>	217 GPa (31 10 <sup>6</sup> psi)	217 GPa (31 10 <sup>6</sup> psi)	331 GPa (48 10 <sup>6</sup> psi)	331 GPa (48 10 <sup>6</sup> psi)	373 GPa (54 10 <sup>6</sup> psi)
<b>Specific stiffness</b>	86 kN.m/g	85 kN.m/g	113 kN.m/g	112 kN.m/g	124 kN.m/g
<b>Poisson's ratio</b>	0.17	0.17	0.17	0.17	0.17
<b>Dynamic shear modulus</b>	97 GPa (14 10 <sup>6</sup> psi)	97 GPa (14 10 <sup>6</sup> psi)	138 GPa (20 10 <sup>6</sup> psi)	138 GPa (20 10 <sup>6</sup> psi)	159 GPa (23 10 <sup>6</sup> psi)
<b>Fracture toughness</b>	2.4 MPa.m <sup>0.5</sup>	2.4 MPa.m <sup>0.5</sup>	3.8 MPa.m <sup>0.5</sup>	3.8 MPa.m <sup>0.5</sup>	N/A
<b>Hardness knoop</b>	1992 kg/mm <sup>2</sup>	N/A	1643 kg/mm <sup>2</sup>	N/A	N/A
<b>Thermal diffusivity</b>	100 mm <sup>2</sup> /s	100 mm <sup>2</sup> /s	115 mm <sup>2</sup> /s	115 mm <sup>2</sup> /s	111 mm <sup>2</sup> /s
<b>Thermal conductivity W/m.K (Btu/hr/ft<sup>2</sup>F)</b>	170 (98)	170 (98)	220 (127)	220 (127)	224 (129)
<b>Instantaneous coefficient of thermal expansion at RT</b>	2.4 10 <sup>-6</sup> /K (1.3 10 <sup>-6</sup> /°F)				

\*Porosity is sealed under the dense coating; porosity is not exposed to the process.

\*\*Porosity sealed off by CVD SiC coating.

#### FOR MORE INFORMATION

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit [entegris.com](http://entegris.com) and select the [Contact Us](#) link to find the customer service center nearest you.

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