Free Form Fibers produces inorganic fibers using its patented “Laser-Printing” process. Examples include silicon carbide, tungsten carbide, boron carbide and boron. Our fiber laser-printing process is derived from the microelectronics industry. It builds upon the broad range of materials commonly used in chip making, and the resultant fibers exhibit properties and purity out of reach of conventional fiber-making approaches.

**SiC Chemistry and Crystallography:**

*X-ray diffraction analysis*—beta 3C FCC silicon carbide identified

<table>
<thead>
<tr>
<th>2-theta (°)</th>
<th>d (Å)</th>
<th>(hkl)</th>
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<tr>
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<td>71.771</td>
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<td>75.502</td>
<td>1.2582</td>
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XRD peak broadening measurements estimate an average grain size in the 7 to 10 nanometer range. TEM imaging indicates elongated grains in the center, on the order of 10 nanometers by 50 nanometers, equiaxed grains moving along the radius to the mid-fiber location with average sizes 5 to 10 nanometer, and amorphous structure at the fiber edge.
Morphology:

High density/low porosity fiber cross-section  

Straight fiber—140 microns total length

Density of SiC fibers: 2.80 - 2.85 grams/centimeter³

Mechanical: Internally developed single fiber tensile testing protocol that avoids translational and angular fiber misalignment to the load axis (procedure to be submitted to ASTM for evaluation)

Tensile strength
4.0 - 6 GPa (as-produced)
1.5 GPa (after 100 hours exposure at 1500°C in air)
0.5 GPa (after 30 minutes exposure at 1650°C in Argon)

Young’s Modulus  390 - 410 GPa

Diameter 30-35 microns

SiC fibers possess excellent manipulation characteristics, i.e. a bend radius of 1/16”

Electrical: 35 ohm-meter electrical resistivity at room temperature (100 Volts applied voltage)

For more information, call Chief Materials Scientist Shay Harrison at 518-690-0396 x2703.