

Hi-Nicalon™

HI-NICALON™ ceramic fiber is a multi-filament silicon carbide-type fiber manufactured by NGS Advanced Fibers Co., Ltd. (NGS) of Japan. NGS is known worldwide as the leading manufacturer and innovator of multifilament silicon carbide-type fibers. **HI-NICALON™** is manufactured near-oxygen-free using electron-beam curing. The fiber is homogeneously composed of ultra-fine beta-SiC crystallites and carbon. The fiber has excellent strength and modulus properties, and has higher thermal stability than NICALON™.

HI-NICALON™ is highly resistant to oxidation and chemical attack and is available in a variety of product forms, depending on the intended use.

USES

HI-NICALON™ ceramic fiber is primarily designed to be used as reinforcements for high temperature ceramic composites. It can also be used as a reinforcement for plastic, and metal matrix composites. Surface treatments are normally recommended to facilitate processing and maximize composite properties. The fiber can also be used to

form fibrous products such as high temperature insulation, filters, etc. Its resistance to chemical attack allows it to be used in harsh environments. Typical fiber properties are shown in Table 1.

PRODUCT FORMS

HI-NICALON™ ceramic fiber is available in several physical forms to offer the user application flexibility. The fiber is coated with polyvinyl alcohol (PVA) sizing for improved handling.

Continuous Fiber

Supplied as multi-filament tow, spooled on 3 inch inner diameter bobbins to 550 meters in length (110 grams/spool). Also available in random lengths at a reduced price.

Woven Cloth

Available as 5HS Weave or 8HS Weave, as identified in Table 2, **HI-NICALON™** cloth is supplied in 1 meter-wide rolls. Other widths, weave or braid styles can be made available. Contact COI Ceramics to discuss specific needs.

HOW TO USE

Ceramic Matrix Composites

HI-NICALON™ fiber can be incorporated as the reinforcement for a variety of ceramic composites. Standard CMC processing techniques, such as sol-gel, chemical vapor infiltration, melt infiltration, or polymer infiltration can be used, depending on the user's needs and capabilities. Candidate matrix materials include silicon carbide, silicon nitride, alumina, glasses, and others. Fiber surface treatments are generally removed before making CMC's, such as by heating to 600°C for 30 minutes. Fiber interface coatings, such as BN, are generally applied to the fiber to achieve optimum CMC properties. The specific fiber type and the specific CMC processing technique is best determined by the user.



COI Ceramics, Inc., offers a variety of advanced ceramic products that are engineered to meet the demanding requirements of high-temperature applications. See the COI Ceramics website for a complete review of the materials solutions available for your applications.
www.coiceramics.com

Polymer or Metal Matrix Composites

Please contact COI Ceramics for additional information on Nicalon™ ceramic fiber, which is well suited for PMC and MMC applications

Weaving, Braiding, and Coating

As textile grade yarn, **HI-NICALON™** fiber can be readily incorporated into a large variety of woven tapes, braids, etc. Specialty interface coatings such as BN (often recommended for optimum CMC mechanical properties) may be applied to the tow or cloth. A number of US vendors exist to respond to customer needs. Contact COI Ceramics to for further information.

SPECIAL PROPERTIES

CMC's reinforced with **HI-NICALON™** ceramic fiber offer distinct advantages over other materials. Oxide fiber and super alloys generally lose mechanical properties above 800°C. SiCO fiber generally loses properties above 1000°C. 100 micron diameter monofilament SiC fiber is generally not possible to weave. **HI-NICALON™** ceramic fiber overcomes these drawbacks.

AVAILABILITY & ORDERING

HI-NICALON™ ceramic fiber is available in North America from COI Ceramics, Inc. For more information, contact the COI Ceramics Sales & Customer Service Office at 801-251-8111.

SAFE HANDLING INFORMATION

Product safety information required for safe use is NOT included. Before handling, read the product Material Safety Data Sheet. An MSDS is available from COI Ceramics.

LIMITED WARRANTY

COI Ceramics (COIC) believes that the information contained herein is an accurate description of the typical properties and uses of the products. It is the customer's responsibility to test the material to determine its performance and safety for your application.

COIC's sole warranty is that the product meets current sales specs. Specification writers should contact COIC for sales specifications. COIC specifically disclaims any other express or implied warranty.

TABLE 1: TYPICAL PROPERTIES AT ROOM TEMPERATURE

Fiber Denier	1800
Density, g/cc	≥ 2.65
Composition, wt% Si:C:O	62:37:0.5
C/Si Atomic Ratio	1.39
Tex, g/km	190-210
Filament Diameter, um (nominal)	14
Tensile Strength, Gpa	≥ 2.50
Tensile Modulus, Gpa	≥ 250
Volume Resistivity, ohm.cm (nominal)	≥ 3
Sizing Amount, wt%	0.5 - 2.0
Oxygen Content, wt%	≤ 1.2

TABLE 2: STANDARD WEAVE CONFIGURATIONS

Weave Style	Yarn Count - ends/inch (warp x fill)	Aerial Weight (g/m2)
5 Harness Satin (5HS)	16 x 16	250-300
8 Harness Satin (8HS)	22 x 22	340-400