

# SiC Fibers Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028 Segmented By Form (Continuous, Woven Cloth, Others), By End User (Aerospace, Energy & Power, Industrial, Others), By Region and Competition

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## Abstracts

Global SiC Fibers Market has valued at USD435.24 million in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 8.88% through 2028. SiC (silicon carbide) fibers are predominantly composed of silicon carbide molecules, imparting them with remarkable properties such as high stiffness, exceptional tensile strength, superior chemical resistance, and low thermal expansion. These fibers are manufactured using various techniques including the Yajima process, chemical vapor deposition (CVD), and laser-driven chemical vapor deposition (LCVD). Continuous research and development efforts are being undertaken to expand the application areas of these fibers.

For instance, silicon carbide fibers are often reinforced with SiC composite matrices, making them ideal for high-temperature structural applications such as in gas turbine engines. These fibers exhibit remarkable resilience and durability under the influence of extreme temperature conditions, with the ability to withstand temperatures up to 2700 degrees Fahrenheit. Furthermore, their capacity to be engineered to meet specific stress levels and operate across a wide temperature range makes them a preferred choice over other materials such as metallic superalloys, monolithic ceramics, carbon fiber composites, and oxide/oxide ceramic composites.

The global SiC fiber market is witnessing significant growth, driven by the increasing demand for silicon carbide fibers in the aerospace sector and the adoption of SiC fibers in the energy and power industry. SiC fibers possess a unique set of characteristics

including high heat resistance, chemical stability, high modulus, lightweight nature, durability, and more. These attributes make them highly suitable for a wide range of aerospace applications, including insulation for heat engines, nanotubes in turbines, ceramic matrix composites (CMC), and alternatives to metallic alloys.

Furthermore, the utilization of SiC fibers in the aerospace industry brings both environmental and economic benefits to aircraft manufacturers. By significantly reducing the weight of aircraft engines and improving fuel efficiency, SiC fibers contribute to reduced emissions and operational costs.

However, the global SiC fiber market has been impacted by the ongoing COVID-19 pandemic, which has disrupted the demand and supply chain across various sectors. With more than 100 countries implementing travel restrictions and trade limitations, international transportation and non-essential trade activities have been severely affected. Manufacturing industries are also operating at reduced capacities due to the risk of infection among the workforces. Additionally, the liquidity crunch and financial crisis have led to decreased demand for silicon carbide (SiC) fibers. The imposition of lockdown measures in countries with prominent aerospace and defense sectors, such as the U.S., France, China, India, Germany, and others, has further contributed to the decline in demand for SiC fibers.

## Key Market Drivers

### Growing Demand of SiC Fibers in Construction Industry

Silicon carbide fibers are synthetic fibers known for their exceptional mechanical, chemical, and thermal properties. They exhibit remarkable stability even in the most extreme conditions, making them highly sought after in various industries. These fibers find their main applications as reinforcement materials for polymers, metals, and ceramics, as well as heat-resistant materials for furnaces and brake components for airplanes.

In recent years, the construction industry has experienced a significant surge in the use of silicon carbide fibers. The unparalleled properties of SiC fibers, such as their exceptional strength, lightweight nature, and resistance to high temperatures and harsh environments, make them an ideal choice for a wide range of construction applications. These fibers are increasingly being integrated into building and infrastructure projects, including bridges, tunnels, and high-rise buildings, to enhance their structural integrity and longevity.

The growing demand for lightweight, durable, and heat-resistant materials in the construction industry is of a key driver behind the increasing adoption of SiC fibers. By incorporating these fibers, structures become more resilient to environmental factors and natural disasters, ensuring their long-term durability. Furthermore, as the construction industry continues to prioritize sustainability and resilience in building solutions, the role of SiC fibers is expected to become even more significant, fueling the growth of the global SiC fibers market.

With their exceptional properties and increasing demand in the construction industry, silicon carbide fibers are poised to revolutionize the way structures are built, offering enhanced performance and longevity while contributing to a more sustainable future.

### Growing Demand of SiC Fibers in Automotive Industry

Silicon carbide fibers, known for their exceptional mechanical, chemical, and thermal properties, have garnered significant attention in various industries. These synthetic fibers exhibit remarkable stability even in the most extreme conditions, making them highly sought after. Typically used as reinforcement materials for polymers, metals, and ceramics, as well as heat-resistant materials for furnaces and brake applications in aircraft, SiC fibers have recently witnessed a notable surge in demand within the automotive industry.

The automotive sector has recognized the unparalleled advantages of SiC fibers, including their high strength, lightweight nature, and resistance to elevated temperatures and harsh environments. These unique properties position SiC fibers as an ideal choice for a wide range of automotive applications. From enhancing the durability of engine components to optimizing the performance of electric vehicle batteries, SiC fibers contribute to revolutionizing the automotive landscape.

The growing need for lightweight, durable, and heat-resistant materials in the automotive industry has driven the rapid adoption of SiC fibers. By leveraging these fibers, not only can vehicle performance be enhanced, but fuel efficiency can also be improved, leading to a reduction in carbon emissions. As the automotive industry continues its pursuit of sustainable and efficient solutions, the role of SiC fibers becomes increasingly crucial, fueling the growth of the global SiC fibers market.

With their exceptional properties and versatility, SiC fibers are poised to play a pivotal role in shaping the future of various industries, including automotive, aerospace, and

manufacturing. As research and technological advancements continue to unfold, the potential applications and benefits of SiC fibers are expected to expand, propelling innovation and progress in the global market.

## Key Market Challenges

### Volatility in Supply of Raw Materials

Silicon carbide fibers are highly regarded synthetic fibers due to their exceptional properties such as high strength, lightweight nature, and remarkable thermal stability even under extreme conditions. These fibers find extensive use as reinforcement materials in a wide range of applications, including polymers, metals, ceramics, and other areas where heat resistance is crucial. The production of SiC fibers involves intricate processes and necessitates specific raw materials, such as silica, which plays a vital role in their manufacturing.

The SiC fibers market is susceptible to volatility in the supply of raw materials, which can have significant implications. For instance, any disruption in the supply of silica can adversely impact the production of SiC fibers. This volatility can stem from various factors, including geopolitical issues, trade restrictions, logistical challenges, and fluctuations in demand and supply dynamics.

Moreover, the global decline in the demand for raw materials has resulted in reduced stockpiling by businesses, thereby affecting the overall supply chain. Additionally, the 2023 Critical Materials Assessment takes into account the economic importance and supply risk associated with non-energy raw materials, including those required for SiC fibers, during the 2016–2020 period.

It is important to note that the challenge of raw material supply volatility is not unique to the SiC fibers market. Many other industries, including the graphite market, face similar issues where price volatility arises due to imbalances in supply and demand.

By understanding and addressing these challenges, industries can strive to mitigate the impact of raw material supply volatility and ensure a more stable and sustainable supply chain for essential materials like SiC fibers.

## Key Market Trends

### Development of SiC/SiC Composites

Silicon carbide fibers are synthetic fibers known for their exceptional mechanical, chemical, and thermal properties. These fibers exhibit high stability even in the most extreme conditions, making them highly desirable for a wide range of applications. They are primarily used as reinforcement materials for polymers, metals, ceramics, and other materials that require exceptional heat resistance.

On the other hand, SiC/SiC composites are a type of ceramic matrix composite (CMC) that are predominantly composed of SiC fibers embedded within a SiC matrix. This unique combination results in a material that not only retains the advantageous properties of SiC fibers but also enhances them further. The SiC fibers provide excellent strength and high-temperature stability, while the SiC matrix ensures exceptional resistance to oxidation.

The development and increasing utilization of SiC/SiC composites have had a significant impact on the SiC fibers market. These composites are being increasingly adopted in various industries due to their superior properties, making them particularly valuable in sectors such as aerospace, nuclear energy, and automotive. In these industries, SiC/SiC composites are employed in components that need to withstand high temperatures and harsh environments.

Furthermore, the growing demand for efficient, durable, and lightweight materials across different industries is expected to further drive the use of SiC/SiC composites, thereby propelling the SiC fibers market to new heights.

## Segmental Insights

### Form Insights

Based on the category of form, the continuous segment emerged as the dominant player in the global market for SiC Fibers in 2022. These advanced fibers have proven to deliver exceptional performance even in high-radiation environments, making them highly sought after by the nuclear power generation industry. The majority of ceramic matrix composites that are reinforced with continuous filaments not only offer superior weight savings, but also exhibit remarkable toughness. As a result, these products are extensively utilized in the production of large critical components within the aerospace and defense industry. Moreover, the ease of handling fiber tows allows for the production of complex-shaped composites, further expanding their range of applications.

## End User Insights

The aerospace segment is projected to experience rapid growth during the forecast period. The rising application scope of silicon carbide fibers in aircraft manufacturing can be attributed to several factors. Silicon carbide fiber composites are increasingly being used in the manufacturing of components for the turbine and combustion section of aero-propulsion engines. This trend is expected to drive the demand for silicon carbide fibers, as these composites offer high performance and durability.

One of the key advantages of silicon carbide fibers reinforced composites is their ability to replace metal parts in aircraft. This substitution is primarily driven by the lightweight nature and excellent heat resistance of silicon carbide fibers. By utilizing these composites, aircraft manufacturers can enhance the fuel efficiency of aircraft engines, resulting in cost savings and environmental benefits.

Furthermore, the increasing use of ceramic matrix composites, which are manufactured using silicon carbide fibers, in high-pressure turbine shrouds is expected to further drive the growth of the silicon carbide fibers market in the forecast period.

Overall, the expanding application areas and the unique properties of silicon carbide fibers position them as a promising material in the aerospace industry, with significant potential for growth in the coming years.

## Regional Insights

North America emerged as the dominant player in the Global SiC Fibers Market in 2022, holding the largest market share in terms of value. The aerospace and defense industry in the U.S. has experienced remarkable growth in production output. This growth can be attributed to increased shipments of general aviation aircraft, civil space systems, and commercial aircraft. Looking ahead, the aerospace and defense industry in the region is expected to witness rapid growth driven by rising manufacturing output. This surge in output is primarily fueled by high domestic and international demand for commercial aircraft. Additionally, the region's defense expenditure is on the rise, further contributing to the industry's expansion. Moreover, the increasing investments for NASA are expected to propel the demand for silicon carbide fibers, creating additional opportunities in this dynamic sector.

## Key Market Players

American Elements Corp

BJS Ceramics GmbH

Free Form Fibers LLC

GE Aviation LLC

Haydale Technologies Inc.

NGS Advanced Fibers Co., Ltd

Nippon Carbon Co., Ltd

Saint-Gobain Ltd

SGL Carbon SE

UBE Industries Ltd.

Report Scope:

In this report, the Global SiC Fibers Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

SiC Fibers Market, By Form:

Continuous

Woven Cloth

Others

SiC Fibers Market, By End User:

Aerospace

Energy & Power



Industrial

Others

SiC Fibers Market, By Region:

North America

United States

Canada

Mexico

Europe

France

United Kingdom

Italy

Germany

Spain

Asia-Pacific

China

India

Japan

Australia

South Korea



South America

Brazil

Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Kuwait

Turkey

Egypt

## Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global SiC Fibers Market.

## Available Customizations:

Global SiC Fibers Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

## Company Information

Detailed analysis and profiling of additional market players (up to five).

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