

Ceramic Matrix Composites Market Report and Forecast 2025-2034

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Report description:

The global ceramic matrix composites market size reached a value of nearly USD 6.10 Billion in 2024 and is further estimated to grow over the forecast period of 2025-2034 at a CAGR of 13.00%.

Ceramic matrix composites (CMCs) represent a cutting-edge class of materials featuring ceramic fibres nestled within a ceramic matrix structure. Common types include silicon carbide reinforced silicon carbide (SiC/SiC), carbon-reinforced carbon (C/C), and oxide-oxide (Ox/Ox). These versatile materials find widespread utility in gas turbines, structural re-entry thermal protection, heat exchangers, and fusion reactor walls. Distinguished by their lightweight nature and ability to withstand high temperatures, CMCs offer exceptional chemical stability and durability against everyday wear and tear. With superior attributes like stiffness, thermal shock resistance, and dimensional stability, CMCs play a pivotal role in diverse industries spanning automotive, electrical, electronics, and power generation.

Rising demand for lightweight, high-performance materials, particularly in the defence sector, propels the global ceramic matrix composites (CMCs) market growth. Applications like infrared domes and sensor protection underscore their significance. Notable for their exceptional heat resistance and mechanical prowess, CMCs benefit from ongoing technological advancements and evolving consumer preferences, fostering continued market expansion.

Figure: Aerospace latest data for backlog

Key Trends and Developments

Robust growth in the global automotive industry, coupled with the high-temperature stability, reduced weight, and enhanced strength of ceramic matrix composites (CMCs), is aiding ceramic matrix composites market development.

October 2023

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RATH Group collaborated with the InVECOF project to advance oxide fibre production in Europe for ceramic matrix composites (CMCs).

October 2023

DITF Denkendorf focused on enhancing carbon fiber sustainability through low-pressure stabilisation and bio-based precursors.

September 2023

GE Aerospace elevated ceramic matrix composite (CMC) production to address aviation's demand for swifter, more efficient engines.

June 2023

The University of Sheffield Advanced Manufacturing Research Centre (AMRC), UK, collaborated with Archer Technicoat Limited, TISICS Metal Composites, and Cygnet Texkimp on Continuous Interface Coating for Silicon Carbide (SiC) composites, or CICSiC.

Significant growth in the automotive industry

Automotive manufacturers prioritise lightweight composite materials over heavy steel and iron, leveraging CMCs for their high tensile strength and heat resistance, enhancing vehicle performance and fuel efficiency.

Rising adoption in the aerospace sector

CMCs are extensively utilised in aerospace for crafting various aircraft components such as engine nozzles, nose caps, tail cones, fins, rudders, leading edges, body flaps, and panels.

Development of novel multifunctional ceramic matrix composites

Nanoscience and nanotechnology are leveraged to enhance the properties, toughness, and electrical conductivity of innovative multifunctional CMCs.

Increasing CMC applications in electronic circuits

CMCs are experiencing market growth driven by their heightened use in electronic circuits, attributed to their superior thermal conductivity.

Global Ceramic Matrix Composites Market Trends

The automotive industry's global expansion drives market optimism for Ceramic Matrix Composites (CMCs), favoured for their strength and heat tolerance. Aerospace sectors also embrace CMCs for diverse applications, from engine components to body panels. Innovations in nanoscience escalates ceramic matrix composites market development through enhanced properties, while their high thermal conductivity spurs adoption in electronic circuits. Additionally, CMCs find utility in LED, laser diodes, and fuel cells, further boosting market growth. Their role extends to manufacturing bullet-proof armour and insulation, diversifying applications, and market prospects.

Robust research and development efforts, along with the widespread use of ceramic matrix composites (CMCs) in high-speed

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mechanical components and power transmission lines, support market growth. Increased demand for SIC/SIC, driven by aerospace and defence equipment manufacturing, particularly in the U.S. and emerging markets, further fuels ceramic matrix composites market expansion. Stringent environmental standards promoting lightweight and fuel-efficient materials also contribute. Major players maintain production amid pandemic challenges, adapting to ensure supply chain resilience and product availability in a dynamic global environment.

Market Segmentation

Global Ceramic Matrix Composites Market Report and Forecast 2025-2034 offers a detailed analysis of the market based on the following segments:

Market Breakup by Composite Type

- Silicon Carbide Reinforced Silicon Carbide
- Carbon Reinforced Carbon
- Oxide
- Others

Market Breakup by Fibre Type

- Short Fibre
- Continuous Fibre

Market Breakup by Fibre Material

- Alumina Fibre
- Refractory Ceramic Fibres
- SiC Fibre
- Others

Market Breakup by Application

- Aerospace and Defence
- Automotive
- Energy and Power
- Electronics and Electricals
- Others

Market Breakup by Region

- North America
- Europe
- Asia Pacific
- Latin America
- Middle East and Africa

Continuous fibres are expected to hold significant ceramic matrix composites market share owing to improved properties offered

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by continuous fibres.

Continuous fibre type ceramic matrix composites (CMCs) are expected to witness the second-highest CAGR within the forecast period. This segment, categorised based on fibre type alongside short fibres and others, is witnessing significant advancements driven by ongoing research and development. Innovations focusing on materials like hafnium carbide (HfC), zirconium carbide (ZrC), and other ceramic composites are enhancing CMC properties for high-temperature applications. As a result, continuous fibre CMCs are projected to exhibit substantial growth from 2025-2034.

As per the ceramic matrix composites market analysis, successful applications of the ceramic matrix composite (CMC) include lightweight components in combustion environments, aerospace equipment like telescopes, heat treatment apparatus such as charging racks, and frictional components like brake disks and clutch linings. Short-fibre composites, composed of materials like non-oxide alumina and oxide alumina, are further reinforced with zirconium oxides, silicon carbide, titanium boride, and aluminium nitride to enhance the ceramic matrix.

Aerospace and defence sector is expected to hold significant ceramic matrix composites market share as diverse application and adoption of CMCs for manufacturing.

During the historical period, the aerospace and defence segment dominated the market, contributing significantly to global revenue. The demand in this segment is expected to be driven by consumer preference for manufacturing various aircraft components such as noses, rudders, fins, leading edges, body flaps, hot structures, tiles, and panels.

These composites, known for their excellent impact strength and high hardness, are ideal for producing bullet-proof armour and insulation in small arms weapons platforms. Additionally, ceramic materials are often transparent to certain types of energy, light, etc., making them valuable for applications like infrared domes, sensor protection, and multi-spectral windows.

The energy and power segment is projected to be the fastest-growing application area for CMC materials. Their properties, including high-temperature stability, oxidation resistance, and radiation tolerance, make them suitable for both fission and fusion applications.

CMCs find extensive use in the electronics industry as isolators and in electronic circuits due to their high thermal conductivity. Furthermore, their applications in ceramics for laser diodes, LEDs, artificial teeth, fuel cells, etc., are expected to further drive market growth.

Competitive Landscape

The market players are increasing their collaboration, partnership, and research and development activities to gain a competitive edge in the market.

Specialty Materials, Inc.,

Founded in 1998 and headquartered in Oklahoma, United States, specialises in producing a variety of products including boron filaments, boron prepreg products, silicon carbide fibre, and boron nanopowder.

Applied Thin Films Inc.,

Established in 1998 in Illinois, United States, offers ceramic matrix composites, ultra thin films, high temperature sealants, and self-healing surfaces among its range of products and services.

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CeramTec GmbH

Founded in 2010 and based in Plochingen, Germany, provides products and services such as 3D printing, catalyst carriers, dielectric and capacitors, and metal matrix composites.

CoorsTek Inc.

With origins dating back to 1910 and headquartered in Colorado, United States, specialises in producing a diverse range of materials including alumina, aluminum nitride, boron carbide, carbon/graphite, and magnesia.

Other key players in the ceramic matrix composites market include Lancer Systems, Rolls-Royce plc, Ultramet, and COI Ceramics, Inc., among others.

Global Ceramic Matrix Composites Market Analysis by Region

North America is a prominent region due to the high adoption of CMC products across several industries with focus on aerospace and defence

In 2022, North America emerged as the dominant market, commanding around half of the total revenue share. This was fuelled by major aviation industries' investments in developing ceramic matrix components and collaborations with government agencies to enhance defence equipment, driving the demand for ceramic matrix composites in the region.

According to the ceramic matrix composites market report, in Asia Pacific, the overconsumption of oil has spurred the pursuit of energy security through alternative sources like natural gas, positioning ceramic matrix composites market to play a pivotal role. Moreover, the growing demand for fuel-efficient aircraft engines is set to bolster the demand for CMC market, aiming to reduce operational costs.

Central and South America are poised to benefit from technological advancements in the aerospace industry, establishing the region as a key manufacturing hub for the U.S. aviation sector. Increased demand across aerospace, automotive, electrical & electronics, and energy & power sectors will further propel ceramic matrix composites market growth.

Africa's lower production costs have attracted significant foreign investments, driving market growth. Additionally, technological advancements in aerospace production are expected to stimulate demand for ceramic matrix composites in the region.

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