

Global Advanced Carbon Materials Market - Materials and Applications

Market Report | 2025-01-23 | 294 pages | Industry Experts

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Report description:

Advanced Carbon Materials Market Trends and Outlook

Advanced Carbon Materials are a specialized class of materials utilized in engineering and scientific innovations due to their exceptional chemical, physical and electrical characteristics. Major types of the same comprise carbon fibers, carbon foams, carbon nanotubes (CNTs), fullerenes and graphene. Due to their distinctive and fundamental characteristics, Advanced Carbon Materials are regarded as the backbone of scientific revolution of the 21st century. They are widely used in various end-use applications, such as aerospace, sporting goods, medical, civil engineering, electronics, biosensors, marine, seismic retrofitting and water & waste management where low weight, high tensile strength, durability, impact absorption, resistance and stiffness are indispensable properties to have.

The high stiffness, high tensile strength and low weight of Carbon Fibers, for example, enable their wide use in composite materials for high-performance applications, such as automotive, aerospace and sports equipment. Graphene comprises a single layer of carbon atoms that is arranged in a hexagonal lattice and offers exceptional electrical conductivity, flexibility and strength, allowing it to be utilized in areas as diverse as flexible electronics, sensors and energy storage devices. Carbon Nanotubes (CNTs) form another type of Advanced Carbon Materials, the remarkable strength, electrical conductivity and thermal stability properties of which make them ideal in the aerospace, electronics and nanotechnology sectors.

The production of Advanced Carbon Materials involves the use of highly advanced techniques to ensure that their characteristics are optimized for specific application areas. For instance, whereas carbon nanotubes (CNTs) and graphene are primarily synthesized using chemical vapor deposition (CVD), arc discharge or laser ablation, pyrolysis of polyacrylonitrile (PAN) or pitch is the preferred method to make carbon fibers. Ongoing R&D efforts aimed at further improving these well-established production processes in terms of quality, scalability and cost-effectiveness will likely result in enhanced product outcome. Advanced composites incorporating various forms of these advanced materials in combination with other materials show immense promise in a number of end-use sectors, including aerospace, automotive, energy and electronics.

The global demand for Advanced Carbon Materials is estimated at US\$18.3 billion in 2024 and is projected to reach US\$27.5 billion by 2030 at a CAGR of 7% between 2024 and 2030. The demand for advanced carbon materials is being driven by several factors, which include their distinctive properties and applications in various end-use sectors. The increasing need for lightweight, high-strength materials in the automotive, aerospace and sports equipment industries is bolstering the market. Developments in nanocarbon technologies, including graphene and carbon nanotubes, are instrumental in creating new prospects in the fields of electronics, biomedical and other sectors. Apart from this, carbon composites are being adopted in energy storage applications,

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such as lithium-ion batteries. Increased investments in research & development are striving towards making these materials more sustainable and lightweight as per the required criteria. Cost-cutting and development of environment-friendly production processes to meet the need of end-users have also been major key factors in surging the demand further.

Advanced Carbon Materials Regional Market Analysis

By geography, Europe is anticipated to be the largest market for Advanced Carbon Materials, owing to low cost of consumables and a large number of aerospace & automotive manufacturing facilities located in the region. Other factors include major emphasis on promoting sustainability and reduction in carbon emissions by following government protocols and mandates. Adoption of lightweight and high-strength materials in end-use sectors, such as automotive, aerospace and renewable energy through the use of carbon fibers and composites, result in making fuel-efficient vehicles and aircrafts. The region's robust research & development ecosystem and stringent government guidelines for reducing the carbon footprint is driving the market significantly, in addition to facilitating clearer energy solutions and solidifying industrial efficiency.

However, Asia-Pacific is expected to be the fastest growing market due to several factors, which include expansion in various industries, such as electronics, automotive, energy storage and rapid industrialization. Leading countries, such as China, South Korea and Japan's significant investments in nanotechnology and cutting-edge materials, along with robust backing by the governments in promoting sustainable development and innovations, are stimulating the market. Accessibility to raw materials and presence of manufacturing facilities have been further instrumental to make Asia-Pacific a leading region in this area. Further, regulatory initiatives for boosting energy output from renewable sources, such as solar and wind, have also been driving growth in the global market.

Advanced Carbon Materials Analysis by Product Type

Carbon Fibers are expected to be the largest product type in the global market for Advanced Carbon Materials. The major factors for its dominance include growing concerns about galvanic corrosion problems related to aluminum use in aerospace applications. The extensive use of this material in the manufacturing of diverse composite applications in the energy, electronics, construction and automotive sectors has been fostering industry expansion. Compared to steel or aluminum, carbon fibers have lower density, are stronger and have a longer lifespan, making them the perfect material for a variety of applications in the production of cars and airplanes. In addition, carbon fiber-reinforced plastics have a high tensile strength and inherent oxidation resistance.

However, the demand for Carbon Foams is expected to be the fastest growing, owing to their inherent properties, such as superior electrical conductivity and chemical inertness, owing to which demand for the same as battery materials has been increasing substantially. In addition, Carbon Foam batteries, while still in the initial stages of development with a very limited number of companies making them, offer the potential to replace lead-acid batteries in various application areas because of features, such as longer life, faster recharges, improved performance under extreme conditions, greater energy efficiency, cost-effectiveness, lighter in weight and superior resistance to corrosion & sulfation. Additionally, ongoing research and development of nanofoams and fireproof foams is further boosting the market.

Advanced Carbon Materials Market Analysis by Application Area

Based on application area, Aerospace & Defense is expected to be the largest in the global market for Advanced Carbon Materials. The demand for these materials in this sector is being driven by their use in innovative product layout of flexible integrated circuits suitable for operations at high temperatures in military aircraft operating at high speeds. Additionally, wing boxes made of advanced carbon composites have been designed as a result of the emphasis on producing lightweight aircraft. There is an increasing need for improved carbon materials due to the fabric requirements of such lightweight systems. On the other hand, the demand for Advanced Carbon Materials in Automotive applications is anticipated to post the fastest growth over the analysis period, owing to growing automobile production across several developing countries and regulatory policies aiming at encouraging energy-efficient vehicles. The latter can only be achieved by replacing heavy structural parts and components in vehicles with lighter and even more stronger alternatives, for which Advanced Carbon Materials provide the best options.

Advanced Carbon Materials Market Report Scope

This global report on Advanced Carbon Materials analyzes the global and regional market based on product type and application area for the period 2021-2030 in terms of value in US\$. In addition to providing profiles of major companies operating in this space, the latest corporate and industrial developments have been covered to offer a clear panorama of how and where the market is progressing.

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Key Metrics

Historical Period: 2021-2023

Base Year: 2024

Forecast Period: 2024-2030

Units: Value market in US\$

Companies Mentioned: 45+

Advanced Carbon Materials Market by Geographic Region

☐☐North America (The United States, Canada and Mexico)

☐☐Europe (France, Germany, Italy, Russia, Spain, The United Kingdom and Rest of Europe)

☐☐Asia-Pacific (China, Japan, India, South Korea and Rest of Asia-Pacific)

☐☐South America (Argentina, Brazil and Rest of South America)

☐☐Middle East & Africa

Advanced Carbon Materials Market by Product Type

☐☐Carbon Fibers

☐☐Carbon Foams

☐☐Carbon Nanotubes (CNTs)

☐☐Fullerenes

☐☐Graphene

Advanced Carbon Materials Market by Application Area

☐☐Aerospace & Defense

☐☐Automotive

☐☐Construction

☐☐Electronics

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- 2d Materials Pte. Ltd.
- 2-Dtech Ltd
- 3D Strong
- 4M Carbon Fiber Corp
- 9T Labs AG
- Abalonyx AS
- Adherent Technologies, Inc.
- Advanced Composites, Inc.
- Advanced Graphene Products Sp. z.o.o.
- Advanced Graphene Solutions, Inc.
- Aidila, Inc.
- Aligned Carbon
- Anaori Carbon Co Ltd
- Arkema S.A.
- Arry International Group Ltd
- BASF SE
- Cabot Corp
- CFOAM LLC
- CNano Technology
- CVD Equipment Corp
- Formosa Plastics Corp
- FutureCarbon Materials GmbH
- Global Graphene Group
- GrafTech International
- Graphenea
- Grupo Antolin Ingenieria S.A
- Grupo Antolin-Irausa, S.A.
- Grupo Graphenano
- Hanwha Chemical
- Haydale Graphene Industries PLC
- Hexcel Corp
- Huntsman Corporation
- Hyperion Catalysis International
- jiangsu CNano Technology Co. Ltd
- Kureha Corporation
- Mersen Group
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- Mitsubishi Rayon
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- NanoGraf
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- Perpetuus Advanced Materials PLC
- Poco Graphite, Inc.
- Resonac Holdings Corp
- SGL Carbon SE
- Shenzhen Sanshun Nano New Materials Co. Ltd
- Showa Denko KK
- Solvay SA
- Teijin Ltd
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