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Single-Walled Carbon Nanotube Market Forecasts to 2030 – Global Analysis By Product Type (Closed Armchair, Zigzag, Chiral and Other Product Types), Synthesis Method, Application, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Single-Walled Carbon Nanotube Market is accounted for $1.17 billion in 2024 and is expected to reach $14.4 billion by 2030 growing at a CAGR of 52.0% during the forecast period. Single-Walled Carbon Nanotubes (SWCNTs) are cylindrical structures made of a single layer of carbon atoms arranged in a hexagonal lattice. They are formed by rolling a graphene sheet into a seamless cylinder. SWCNTs have remarkable physical properties, including tensile strength, electrical conductivity, and thermal stability. Their electrical characteristics can be metallic or semiconducting, depending on the carbon atom's 'chirality.' SWCNTs are highly efficient in conducting electricity, making them ideal for applications in electronics, nanotechnology, and energy storage. Their potential has led to significant research into their synthesis, functionalization, and integration into practical technologies.

Market Dynamics:

Driver:

Exceptional material properties

Exceptional material properties include extraordinary tensile strength, electrical conductivity and thermal stability. These properties make SWCNTs highly valuable in a wide range of industries, from electronics to energy storage. Their unique ability to

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conduct electricity along their length, combined with their lightweight and high-strength characteristics, makes them ideal for applications. The growing demand for lightweight and high-strength materials in aerospace, automotive, and construction sectors further drives the single-walled carbon nanotube market.

Restraint:

Complex manufacturing processes and specialized equipment

Producing high-quality single-walled carbon nanotube requires specialized equipment and techniques, such as chemical vapor deposition (CVD) or arc discharge, which can be expensive and difficult to scale. Additionally, controlling the chirality during production is a complex task, as even slight variations in their structure can dramatically affect their properties and performance. These factors limit the availability of single-walled carbon nanotube and increase production costs, restricting market growth.

Opportunity:

Increasing demand for lightweight and high-strength materials

Industries such as automotive, aerospace and electronics are increasingly turning to advanced nanomaterials like nanotubes to improve performance and reduce weight without sacrificing strength. In particular, the use of SWCNTs in composite materials for structural components is gaining traction due to their ability to improve the mechanical properties of polymers, ceramics, and metals. The rise of electric vehicles (EVs) and other high-performance applications, which require lighter and stronger materials for improved efficiency, is expected to drive demand for single-walled carbon nanotube -based materials.

Threat:

Potential health and environmental risks

Studies have shown that inhalation of carbon nanotubes can lead to respiratory issues, and their small size allows them to potentially penetrate biological membranes. Moreover, the disposal of single-walled carbon nanotube and their potential toxicity in the environment raise concerns about long-term ecological effects. As the market for single-walled carbon nanotube expands, addressing these health and environmental risks will become crucial to ensuring safe use and preventing regulatory restrictions that

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could hinder market growth.

Covid-19 Impact

Manufacturing delays and reduced research activities affected the rate at which new applications and innovations were developed. On the other hand, the pandemic highlighted the importance of advanced materials, including SWCNTs, in areas such as medical devices, personal protective equipment (PPE), and energy storage solutions. As industries adapt to post-pandemic realities, there is renewed interest in nanotechnology and advanced materials. The growing need for innovative solutions in healthcare, energy, and electronics is expected to accelerate the recovery and expansion of the single-walled carbon nanotube market.

The armchair segment is expected to be the largest during the forecast period

The armchair segment is expected to account for the largest market share during the forecast period due to their metallic nature, offering higher current-carrying capacity and lower resistive losses compared to traditional materials. This leads to improved performance in consumer electronics and semiconductor industries. They are also being explored for energy storage and generation in supercapacitors and batteries due to their high electrical conductivity and larger surface area, making them ideal for energy-efficient technologies like electric vehicles and renewable energy systems.

The laser ablation segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the laser ablation segment is predicted to witness the highest growth rate due to cutting-edge technologies, such as quantum computing, nanosensors, and high-strength composites. These applications require materials with minimal impurities and high uniformity, which laser ablation, can deliver. The growing demand for such advanced materials in industries like aerospace, automotive, and electronics supports the adoption of laser ablation techniques driving the market growth.

Region with largest share:

During the forecast period, the North America region is expected to hold the largest market share due to advanced methods for synthesizing superconducting wedge nanotubes (SWCNTs) with improved chirality control, structural uniformity, and scalability. Techniques like chemical vapor deposition, laser ablation, and plasma-

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enhanced growth. Universities and corporate research labs are also tailoring single-walled carbon nanotube for specific use cases like energy storage, flexible electronics, and advanced sensors, ensuring seamless integration into existing technologies.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR owing to lightweight structural components like chassis, body panels, and frames to improve vehicle efficiency and range in electric vehicles (EVs). They meet emission standards and enhance performance in high-performance and luxury vehicles. SWCNTs are also being used in advanced sensors and electronics for autonomous driving, connectivity, and safety features, supporting the development of smart and autonomous vehicles, driving demand in the APAC automotive sector.

Key players in the market

Some of the key players in Single-Walled Carbon Nanotube market include Arkema SA , Arry International Group Limited , Cabot Corporation, Carbon Solutions, Inc., Hanwha Chemical Corporation, Hyperion Catalysis International, Jiangsu Cnano Technology Co., Ltd., Klean Commodities, Nanocyl SA, NanoLab , Nanoshell LLC, NoPo Nanotechnologies, OCSiAl, Showa Denko K.K. and Thomas Swan & Co. Ltd.

Key Developments:

In January 2025, Arkema and ALBIS partner in the distribution of high-performance medical-grade polymers for the healthcare market. These polymers are known for their chemical resistance, flexibility and compliance with industry standards, supporting the strict requirements of manufacturers in the healthcare field.

In December 2024, Arkema finalized he acquisition of Dow’s flexible packaging laminating adhesives business, one of the leading global producers of adhesives for the flexible packaging market.

In August 2024, Array unveiled SkyLink tracker system to maximize solar efficiency in extreme weather & reduce costs, a revolutionary PV-powered wireless tracker system that builds on the capabilities of DuraTrack® and OmniTrack™? offerings.

Product Types Covered:

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Armchair

Zigzag

Chiral

Other Product Types

Synthesis Methods Covered:

Arc Discharge

Laser Ablation

Chemical Vapor Deposition (CVD)

Other Synthesis Methods

Applications Covered:

Transistors & Flexible Electronics

Supercapacitors

Drug Delivery Systems & Biosensors

Water Purification

Structural Reinforcement

Sensors & Actuators

Other Applications

End Users Covered:

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- Electronics & Semiconductors
- Energy & Power
- Healthcare
- Aerospace & Defense
- Automotive
- Construction
- Other End Users

Regions Covered:

- North America
  - US
  - Canada
  - Mexico
- Europe
  - Germany
  - UK
  - Italy
  - France
  - Spain
  - Rest of Europe

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- Asia Pacific
  - Japan
  - China
  - India
  - Australia
  - New Zealand
  - South Korea
  - Rest of Asia Pacific
- South America
  - Argentina
  - Brazil
  - Chile
  - Rest of South America
- Middle East & Africa
  - Saudi Arabia
  - UAE
  - Qatar
  - South Africa
  - Rest of Middle East & Africa

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What our report offers:
- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2022, 2023, 2024, 2026, and 2030
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations
- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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Note: Tables for North America, Europe, APAC, South America, and Middle East & Africa Regions are also represented in the same manner as above.

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