

Activated Carbon - A Global Market Overview

Market Report | 2025-02-06 | 364 pages | Industry Experts

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Report description:

Activated Carbon Market Trends and Outlook

Commonly referred to as activated charcoal, Activated Carbon is a highly porous and high-purity form of carbon having a large surface area and microscopic pores. The material is recognized for its outstanding adsorption properties that enable it to be used in a variety of application areas, including water & wastewater treatment, air purification, processing of foods & beverages, pharmaceuticals, mining & metal extraction and automotive canisters. Activated Carbon is highly effective in adsorbing dissolved organic contaminants and removing flavors and odor-changing chemicals. Activated carbon injection (ACI) is a technology that is being employed as an economic option in purification processes. Whereas the material can be made using a variety of carbonaceous sources, such as coconut shells, coal, wood and peat, these usually involve carbonization and activation that can have a detrimental environmental impact.

Worldwide, volume consumption of Activated Carbon is estimated at 3.7 million metric tons in 2024 and is likely to maintain a 2024-2030 CAGR of about 8% in reaching a projected 5.8 million metric tons by 2030. In terms of value, the global market for Activated Carbon is projected to reach US\$13 billion by 2030 from an estimated US\$8.3 billion in 2024 at a CAGR of 7.8% between the two years. Some of the factors driving demand for Activated Carbon include growing application of this versatile material across a range of sectors, including water treatment, medical & pharmaceuticals, automotive, food & beverages and air purification, among others. Increase in concerns regarding the importance of pure water for personal, as well as industrial, uses provide further impetus for Activated Carbon. For example, the United States Environmental Protection Agency (EPA) has emphasized the importance of Activated Carbon in controlling synthetic organic chemicals in drinking water, for which a filter with granular activated carbon (GAC) is widely employed. Stringent rules regarding maintenance of water purity to ensure public health safety and rigorous air quality regulations aimed at reducing air pollution levels are also factors contributing to growing demand for Activated Carbon. The use of this innovative material in air filtration and purification systems has grown considerably for adhering to regulatory policies, thereby highlighting the need for environmental sustainability.

Activated Carbon's applications across several industries has been well known, one instance of which is the chemical sector, where its use in the purification and separation processes is invaluable. The pharmaceutical industry is also a significant consumer of Activated Carbon as a decolorizing agent and an adsorption agent to remove unwanted pigments and dyes in the manufacture of medicines, which makes sure that the final products stick to safety and quality standards. In the food & beverage industry,

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Activated Carbon plays a major part in eliminating impurities and enhancing product integrity. Automotive applications of the material include control of emissions, removal of volatile organic compounds (VOCs) and enhance cabin air quality. Automotive cabin air filters comprising granular activated carbon (GAC) or activated air filter pads purify air, with coconut shell activated carbon having mechanical hardness and high microporosity being the preferred material. In automotive evaporative emission control canisters, the Activated Carbon used typically has low density and high mesopore volume, making it ideal for consistent adsorption and release of gasoline vapors in the fuel system.

Activated Carbon Regional Market Analysis

Asia-Pacific is the leading global market for Activated Carbon in terms of both volume and value, as also forecast growth. Rapid industrialization and economic development in countries, such as China and India, are contributing to growing demand for the material. The demand for Activated Carbon in various sectors, such as manufacturing, chemicals, pharmaceuticals and food & beverages for various purification and filtration processes is considerably high in the region. Added to this is the growing need for safe drinking water that is being fueled by an increasing population and urbanization. Moreover, governments across the region have enacted stringent regulations for minimizing air and water pollution, thereby further boosting the market for Activated Carbon which is widely used for the same. In the United States, the EPA's crackdown on mercury emissions is expected to propel demand for Activated Carbon in North America, given that the US is the region's largest market for the material. Strict government policies aimed at reducing toxic gas emissions and promoting the reuse of industrial water are driving the European demand for Activated Carbon.

Activated Carbon Market Analysis by Type

Based on type, the global market for Activated Carbon is segmented into Granular Activated Carbon (GAC), Powdered Activated Carbon and Other Activated Carbon Types (including Extruded/Pelleted Activated Carbon and Cloth-Based Activated Carbon). Among these, the demand for PAC is the largest, since the material's fine particle size and high surface area make it well-suited for water treatment, air purification and food processing applications through enhanced adsorption efficiency. However, the global market for GAC is likely to register the fastest growth over the analysis period, owing to its wider use for large-scale applications, such as treating industrial air and water. The Other Activated Carbon Types category comprising Extruded/Pelleted and Cloth-Based Activated Carbons are primarily used in niche applications, such as mercury removal and personal protective equipment. All things considered, industry-specific needs finally dictate the demand trends for the various types of Activated Carbons, since each has its own set of properties and benefits with regard to efficiency, cost-effectiveness and ease of use.

Activated Carbon Market Analysis by Raw Material

Coal, Coconut Shells, Peat and Wood are the primary raw materials used for deriving Activated Carbon. Within these, Coal-based Activated Carbon accounts for the largest share, since its excessive hardness and capacity to adsorb a variety of contaminants is ideal for industrial applications. However, the demand for Coconut Shell-based Activated Carbon is anticipated to maintain the fastest growth, as this variety is most extensively utilized for water purification and air filtration because of a high adsorption capability and micropore structure. In applications where lower hardness is acceptable, such as in food & beverages, Wood- and Peat-based Activated Carbons are preferred.

Activated Carbon Market Analysis by Application

Gas Phase and Liquid Phase are the two applications via which Activated Carbon is used, of which the former has a larger share. This can be attributed to the wide use of Gas Phase Activated Carbon in pellet, powder or granule form in air filters for purifying air by removing pollutants, such as volatile organic compounds (VOCs), ozone and other gases. Activated Carbon in this phase adsorbs these pollutants as they pass through the filters to clean the air. HEPA filters are typically combined with Activated Carbon filters for capturing additional microscopic particles, such as dust, lint, mold spores, pet dander and pollen. Liquid Phase applications of Activated Carbon, though, are likely to post a faster growth, since water & wastewater treatment is one of the major uses for the same. The need for safe drinking water, in addition to pure water for pharmaceutical & medical and industrial applications, are the major factors propelling growth for this application area.

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Activated Carbon Market Analysis by End-Use Sector

Among the various end-use sectors for Activated Carbon, the market for Water & Wastewater Treatment is the largest. Here, the material's adsorption capacity enables in binding impurities chemically on an activated carbon filter's surface, as against physically absorbing them. Water filters based on Activated Carbon are highly effective in eliminating virtually all toxins from water and decolorizing it, even while retaining the important minerals and salts. This helps in treating potable, as well as industrial water to make it pure for consumption and various manufacturing activities where purified water is needed. The Pharmaceutical & Medical sector is another key area for Activated Carbon, where the requirement for exceptional purity all through the processing activities is non-negotiable. An important application of Activated Carbon in Pharmaceuticals is treating intermediates to eliminated unwanted byproducts without modifying any important chemical inputs. In the Medical field, the material is used to treat certain kinds of drug overdose and metal poisonings by binding toxins through adsorption. Capsules or tablets containing Activated Carbon are also suggested to treat gastrointestinal problems, such as constipation, diarrhea and flatulence. Due to these reasons, it is expected that the demand for Activated Carbon in the Pharmaceutical & Medical sector will record the fastest growth during the analysis period. Other important end-use sectors for the material include Air Purification, Automotive, Food & Beverages and Industrial.

Activated Carbon Market Report Scope

This global report on Activated Carbon analyzes the global and regional markets based on technology, product type, application and end-user for the period 2021-2030 with projections from 2024 to 2030 in terms of volume in metric tons and 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.

Key Metrics

Historical Period: 2021-2023

Base Year: 2024

Forecast Period: 2024-2030

Units: Value market in US\$

Companies Mentioned: 40+

Activated Carbon 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

Activated Carbon Market by Type

☐ Granular Activated Carbon (GAC)

☐ Powdered Activated Carbon (PAC)

☐ Other Activated Carbon Types (including Extruded/Pelleted Activated Carbon & Cloth-Based Activated Carbon)

Activated Carbon Market by Raw Material

☐ Coal

☐ Coconut Shell

☐ Peat

☐ Wood

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Activated Carbon Market by Application

- ? □ Gas Phase Applications
- ? □ Liquid Phase Applications

Activated Carbon Market by End-Use Sector

- ? □ Air Purification
- ? □ Automotive
- ? □ Food & Beverages
- ? □ Industrial
- ? □ Pharmaceutical & Medical
- ? □ Water & Wastewater Treatment
- ? □ Other End-Use Sectors (incl. Electronics, Mining and Oil & Gas)

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