

Nano-Porous Material Market Report: Trends, Forecast and Competitive Analysis to 2030

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Abstracts

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Nano-Porous Material Trends and Forecast

The future of the global nano-porous material market looks promising with opportunities in the petroleum refining, water treatment, pet litter, and food & beverage markets. The global nano-porous material market is expected to reach an estimated \$8.0 billion by 2030 with a CAGR of 8.7% from 2024 to 2030. The major drivers for this market are the increasing demand in environmental remediation for its high surface area and absorption properties, growing applications in energy storage systems for its lightweight and high porosity characteristics, and advances in nanotechnology enhancing the structural stability of nano-porous materials.

Lucintel forecasts that, within the type category, zeolite is expected to witness the highest growth over the forecast period.

Within this application category, petroleum refining is expected to witness the highest growth.

In terms of regions, APAC is expected to witness the highest growth over the forecast period.

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Emerging Trends in the Nano-Porous Material Market

The nano porous material market is expanding rapidly as advances in nanotechnology unlock new possibilities across industries like energy storage, environmental remediation, healthcare, and catalysis. As the demand for efficient, sustainable solutions increases, the development and commercialization of nano porous materials are creating new opportunities for innovation across various sectors, driving substantial market growth.

Enhanced functionalization: The trend toward improving the functional properties of nano porous materials is gaining momentum. These special features may include adsorption capacity, selectivity, and reactivity toward specific gases or liquids, such as H₂S removal from natural gas under varying temperatures and pressures using CO₂ transportation systems. Such advancements have made these materials more versatile and increased their efficiency, making them widely used in environmental management and the energy sector.

Sustainability and green technologies: Sustainable, environmentally friendly nano porous materials are increasingly becoming an area of intense focus globally. Some innovations aim to reduce environmental impacts caused by the production process by using renewable raw inputs or biodegradable starting compounds that can minimize the waste produced during synthesis operations. Global sustainability targets, coupled with various regulations, push forward green approaches applied across different fields, including wastewater treatment and industrial processes.

Integration with smart technologies: The integration of smart technologies with nano porous materials is a significant trend. This includes sensors and responsive features that enable real-time monitoring and adaptive functionality. Applications are being developed for smart filtration systems, advanced sensing devices, and other uses, broadening application and market opportunities.

Cost reduction and scalability: Reducing production costs and ensuring scalability are critical trends in the nano porous material market. Innovations in manufacturing techniques, as well as the development of more affordable raw materials, have made these technologies more accessible. This trend is crucial for promoting widespread adoption and broadening market horizons in both developed and developing countries.

Gas separation technologies: There is growing interest in using nano porous materials for gas separation processes, particularly in capturing carbon dioxide and other greenhouse gases, contributing to environmental sustainability.

These emerging trends denote the dynamic momentum characterizing the nano porous materials market. Increasingly functionalized, sustainable, smart technology-integrated, and cost-effective innovations are driving industry growth by expanding applications.

Recent Developments in the Nano-Porous Material Market

The nano-porous materials market is experiencing rapid growth, driven by the increasing demand for highly efficient materials in diverse applications such as energy storage, catalysis, environmental remediation, and drug delivery. Ongoing innovations and advancements in various sectors of the nano porous material market have been highlighted by recent developments:

Breakthroughs in MOFs for Gas Storage: Recent advances have enhanced the utilization of gas storage applications through Metal Organic Frameworks (MOFs). New designs for MOFs provide exceptional properties to absorb gases such as hydrogen and methane, making them ideal candidates for energy storage and environmental management. The synthesis of MOF innovations has improved stability and scalability, thus considering them one of the major sustainable energy material solutions. Such achievements make MOFs attractive choices for both industrial and research needs.

Advancements in Water Purification Technologies: Nano porous materials have shown significant potential when applied to water purification through the development of advanced filtration systems. Recent inventions have included adsorption properties that help remove heavy metals and organic pollutants, including microorganisms, characterized by greater efficiency compared to earlier methods. The main drive behind this progress lies in the necessity to provide effective solutions that can be scaled globally to tackle water shortages and contamination challenges. Furthermore, improved manufacturing processes make these filtration technologies cost-effective.

Development of Smart Nano Porous Sensors: The integration of nano porous materials with smart technology has resulted in the development of advanced sensing devices. Recent reports highlight environmental sensors using MOFs

for monitoring gas concentration and pollutants in real-time. The high sensitivity and selectivity offered by these intelligent sensors make them useful tools for industrial, environmental, and healthcare purposes. There is also a rising trend toward smart technology, enhancing the applicability of nano porous materials.

Sustainable Production Methods: Research is increasingly focusing on sustainable production methods for nano porous materials. Recent developments include the use of green chemistry techniques and renewable raw materials aimed at minimizing the negative impact on the environment, especially through energy conservation and waste reduction with global objectives in mind. This shift toward eco-friendly manufacturing contributes to increasing adoption rates among environmentally conscious end users who prefer using nano porous materials.

Recent developments demonstrate progress in MOFs for gas storage, water purification technologies, smart sensors, and sustainable production methods. Ongoing innovations will continue to drive growth and diversification of the nano porous materials market, thereby addressing key challenges while opening up new opportunities for market players operating in this field.

Strategic Growth Opportunities for Nano-Porous Material Market

The nano-porous material market is experiencing rapid growth, driven by the unique properties of nanoporous materials, including high surface area, tunable pore sizes, and exceptional adsorption capabilities. Some key strategic growth opportunities for this market include:

Energy Storage Solutions: This market offers a significant opportunity for innovation in energy storage solutions. The high surface area of nanoporous materials and their adsorption capabilities improve the efficiency and performance of energy storage devices. Recent innovations in nanoporous materials have led to breakthroughs in design, enabling the development of new storage technologies that support the increasing demand for renewable energy and electric vehicles.

Environmental Remediation: There is an opportunity for growth in environmental cleaning through the use of nanomaterials as filters and desiccants. Water and air purification systems can be made with these materials, rendering them very

effective in removing contaminants and pollutants. This is a key area for growth, given the increasing need for cutting-edge remediation technologies amidst rising environmental concerns and stricter regulations.

Industrial Catalysis: Nanoporous materials are critical for industrial catalysis, providing large surface areas and reactivity for diverse chemical processes. Advanced catalyst designs, enabled by developments in catalyst synthesis, have found applications in the petrochemical refining and chemical manufacturing industries. As the trend advances toward more sustainable and efficient industrial processes, there is an increase in demand for effective nanoporous catalysts.

Consumer Products: An emerging market exists for consumer products that integrate nanoporous materials, such as high-performance filters and smart textiles. Advances in this area enhance product functionality, improving quality and satisfying consumers' increasing demand for long-lasting and sustainable products. This trend is driving the adoption of various forms of nanofiltration among a range of consumers.

In brief, these strategic growth opportunities demonstrate potential applications for nanoporous materials, including energy storage systems, environmental remediation, industrial catalysis, and consumer products. These prospects highlight innovative possibilities that firms can explore to gain a competitive advantage while entering emerging markets.

Nano-Porous Material Market Driver and Challenges

The nano porous material market is shaped by a range of technological, economic, and regulatory factors that both drive its growth and present significant challenges. Understanding these dynamics is crucial for stakeholders aiming to innovate and compete effectively in this rapidly evolving industry, where advancements and market demand continuously redefine opportunities and obstacles.

The factors responsible for driving the nano porous material market include:

Technological Advancements: Continuous research in nanotechnology leads to the development of better advanced nano porous materials with more potential uses. The growing use of synthesis techniques and material fabrication is

promoting rapid growth.

Growing Environmental Concerns: Increasing concern about the environment and mounting regulatory pressures have seen the demand for advanced water and air purification materials rise. Nano porous materials provide effective means to address these issues, thus contributing to growth.

Rising Demand for Energy Storage: The increased need for efficient energy storage solutions driven by electric vehicles (EVs) and renewable energy sources creates opportunities for nano porous materials in batteries and supercapacitors. This growing need can be satisfied by high-performance devices with large surface areas, such as nano porous carbons.

Expanding Industrial Applications: These applications can be notably identified in catalysis and chemical processing, among others. In different sectors, the ability of nano porous materials to enhance reaction efficiency or process performance makes them attractive for use.

Emerging Applications: New applications for nano porous materials are continually being explored, from drug delivery systems in healthcare to novel catalysts in chemical processes. As industries seek innovative solutions to complex problems, the versatility of nano porous materials positions them as critical components across multiple sectors, significantly expanding the market's potential.

Challenges in the nano porous material market are:

High Production Costs: Producing nano porous materials may be expensive due to the complex synthesis and processing they require. This affects affordability and scaling up, leading to reduced market potential for such products.

Regulatory Hurdles: Navigating regulations on nanomaterials can be quite demanding, affecting product innovation and market entry. Therefore, observing environmental preservation regulations is fundamental for success in this market segment.

Market Competition: High competition within the nano porous materials market may lead to low-profit margins, forcing companies into continuous innovation.

Organizations need distinctiveness to avoid losing sales.

Technological developments in nanotechnology and increased environmental and energy needs are propelling growth in the nano porous market. However, challenges such as high production costs, regulatory barriers, and competition from substitutes still need to be resolved before the full potential of this market can be realized.

List of Nano-Porous Material Companies

Companies in the market compete on the basis of product quality offered. Major players in this market focus on expanding their manufacturing facilities, R&D investments, infrastructural development, and leverage integration opportunities across the value chain. Through these strategies nano-porous material companies cater increasing demand, ensure competitive effectiveness, develop innovative products & technologies, reduce production costs, and expand their customer base. Some of the nano-porous material companies profiled in this report include-

Albemarle Corporation

Mineral Technologies

Chemviron Carbon

Calgon Carbon Corporation

Kuraray Chemical

Zeolyst International

Clariant

Nano-Porous Material by Segment

The study includes a forecast for the global nano-porous material market by type, application, and region.

Nano-Porous Material Market by Type [Analysis by Value from 2018 to 2030]:

Zeolites

Silica Gel

Activated Carbon

Activated Alumina

Others

Nano-Porous Material Market by Application [Analysis by Value from 2018 to 2030]:

Petroleum Refining

Water Treatment

Pet Litter

Food & Beverages

Others

Nano-Porous Material Market by Region [Analysis by Value from 2018 to 2030]:

North America

Europe

Asia Pacific

The Rest of the World

Country Wise Outlook for the Nano-Porous Material Market

The market is expanding its operations and forming strategic partnerships to strengthen its position. The content below highlights recent developments in key countries: the US,

China, Germany, India, and Japan.

United States: In the USA, there have been recent innovations involving nanoporous materials in advanced filtration techniques such as energy storage. Some examples include the use of metal-organic frameworks (MOFs) to achieve better gas separation and storage, as well as enhanced water purification systems with improved nanoporous materials. These developments also involve research investments aimed at improving these materials for different industrial applications, including environmental industries and energy sectors.

China: China has made remarkable progress in nanoporous materials, particularly in industrial application areas like the environment. This includes cheaper solid catalysts used in chemical processes and engineered media for wastewater treatment that enhance mass transfer rates by increasing surface area contact between liquid-phase reactants and effluent streams being treated. Additionally, efforts are being made by China's government bodies and industry players to scale up production capabilities, adopting these materials into large-scale manufacturing driven by strong R&D investments from various organizations within the country.

Germany: One characteristic of Germany's nanoporous market is its focus on high-precision applications, especially in the automotive and aerospace industries. The latest development involves cutting-edge nanoporous coatings that demonstrate substantial improvements in thermal insulation capacity, making them highly durable. The integration of these new technologies into energy efficiency and advanced manufacturing processes is being driven by relationships between industry players and academic institutions within the country.

India: The nanoporous materials market in India is witnessing growing demand for cost-effective, scalable solutions. Some of the latest developments include nanoporous materials for water purification and air filtration systems. Due to increasing environmental challenges and the need to improve public health, Indian research aims to develop low-cost technologies suitable for local conditions. Increasing industrial interest in this field, along with technological advancements supported by government programs, has been pivotal in driving market growth.

Japan: Japan is advancing in nanoporous materials with a focus on high-tech

applications and environmental solutions. Another recent development is the use of nanoporous materials in energy storage devices, such as batteries, which target high-power density applications. There are also plans among Japanese companies to incorporate these materials into future electronics and technology products, coupled with ongoing efforts to strengthen R&D capabilities.

Features of the Global Nano-Porous Material Market

Market Size Estimates: Nano-porous material market size estimation in terms of value (\$B).

Trend and Forecast Analysis: Market trends (2018 to 2023) and forecast (2024 to 2030) by various segments and regions.

Segmentation Analysis: Nano-porous material market size by type, application, and region in terms of value (\$B).

Regional Analysis: Nano-porous material market breakdown by North America, Europe, Asia Pacific, and Rest of the World.

Growth Opportunities: Analysis of growth opportunities in different types, applications, and regions for the nano-porous material market.

Strategic Analysis: This includes M&A, new product development, and competitive landscape of the nano-porous material market.

Analysis of competitive intensity of the industry based on Porter's Five Forces model.

If you are looking to expand your business in this market or adjacent markets, then contact us. We have done hundreds of strategic consulting projects in market entry, opportunity screening, due diligence, supply chain analysis, M & A, and more.

This report answers following 11 key questions:

Q.1. What are some of the most promising, high-growth opportunities for the nano-porous material market by type (zeolites, silica gel, activated carbon, activated alumina, and others), application (petroleum refining, water treatment, pet litter, food & beverages, and others), and region (North America, Europe, Asia Pacific, and the Rest

of the World)?

Q.2. Which segments will grow at a faster pace and why?

Q.3. Which region will grow at a faster pace and why?

Q.4. What are the key factors affecting market dynamics? What are the key challenges and business risks in this market?

Q.5. What are the business risks and competitive threats in this market?

Q.6. What are the emerging trends in this market and the reasons behind them?

Q.7. What are some of the changing demands of customers in the market?

Q.8. What are the new developments in the market? Which companies are leading these developments?

Q.9. Who are the major players in this market? What strategic initiatives are key players pursuing for business growth?

Q.10. What are some of the competing products in this market and how big of a threat do they pose for loss of market share by material or product substitution?

Q.11. What M&A activity has occurred in the last 5 years and what has its impact been on the industry?

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