

Near Infrared Absorbing Materials Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028 Segmented By Material (Organic, Inorganic), By Function (High Transparency, Absorption, Heat Resistance), By End Use Industry (Electronics & Telecommunications, Industrial Sector, Defence & Security, Photovoltaics, Others), By Region and Competition

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Abstracts

In 2022, the Global Near Infrared Absorbing Materials Market was valued at USD 307.06 million, and it is expected to experience robust growth in the forecasted period with a Compound Annual Growth Rate (CAGR) of 7.34%. Near-infrared absorbing materials possess a unique capability, as they combine excellent transparency to visible light with selective absorption of near-infrared wavelengths. When integrated into window materials, these substances effectively reduce the energy from near-infrared sunlight, thereby minimizing temperature increases within a room while maintaining sufficient brightness.

Key Market Drivers

Rising Demand of Near Infrared Absorbing Materials in Electronics & Telecommunications Industry

Electronics & Telecommunications is a dynamic and ever-evolving industry characterized by rapid technological advancements and the constant quest for enhanced performance and functionality. Within this sector, Near Infrared (NIR)

absorbing materials have emerged as critical components, driving innovations in various applications. Near Infrared absorbing materials are substances that possess the unique ability to absorb and manipulate light within the Near Infrared spectrum, which ranges from approximately 750 nanometers (nm) to 2500 nm. This optical property makes them invaluable in a multitude of applications, particularly within the Electronics & Telecommunications sector. One of the foremost applications of NIR absorbing materials in electronics is their use in optical filters and sensors. These materials allow precise control over the transmission and absorption of NIR light, enabling the creation of optical devices with superior performance characteristics. NIR filters find extensive use in telecommunications equipment, enhancing signal quality and reducing interference. Additionally, NIR sensors enable accurate measurements of various physical parameters, including temperature, moisture, and gas concentrations, making them indispensable in electronic systems. The demand for high-speed and reliable data transmission has led to the adoption of optical communication technologies, such as fiber optics. NIR absorbing materials play a crucial role in this domain by facilitating the manipulation and management of optical signals. They enable the development of components like optical switches, modulators, and wavelength-selective devices, which are essential for the efficient transmission of data over optical networks. As data demands continue to soar, the need for NIR materials in telecommunications is expected to grow exponentially.

Moreover, in the quest for sustainable energy sources, NIR absorbing materials have found applications in photovoltaics and solar cells. These materials enhance the absorption of sunlight, extending the spectral range over which solar cells can convert light into electricity. This translates to improved energy conversion efficiency, making solar panels more productive and economically viable. With the global push for renewable energy sources, the demand for NIR materials in photovoltaics is set to rise substantially. Modern electronic devices, from smartphones to large-screen televisions, rely on advanced display technologies for enhanced user experiences. NIR absorbing materials are pivotal in the development of displays with superior color accuracy, contrast ratios, and energy efficiency. They are utilized in Liquid Crystal Displays (LCDs), Organic Light Emitting Diodes (OLEDs), and other emerging display technologies. As consumers continue to demand sharper, brighter, and more energy-efficient displays, the incorporation of NIR materials will be fundamental in meeting these expectations. The Electronics & Telecommunications market has witnessed a surge in biometric authentication technologies, such as fingerprint and facial recognition. NIR sensors, integrated with these systems, enable secure and fast biometric identification. These materials enhance the accuracy of biometric sensors, even in challenging lighting conditions. As security concerns drive the adoption of

biometric authentication in electronic devices and telecommunications, the demand for NIR materials will escalate.

Furthermore, Photonic Integrated Circuits (PICs) are at the forefront of optical signal processing in telecommunications. NIR absorbing materials are essential components in the development of PICs, enabling the integration of various optical functions on a single chip. This miniaturization results in more compact and energy-efficient devices for optical signal routing and processing. The demand for high-speed data transmission and optical networking is propelling the use of NIR materials in PICs. The global push for renewable energy sources to combat climate change is driving investments in photovoltaics and solar energy. NIR absorbing materials are vital for boosting the efficiency of solar cells, making them an integral component of the transition to sustainable energy solutions. As governments and industries invest heavily in renewable energy, the demand for NIR materials in solar applications is set to surge, leading to the demand of market in the forecast period.

Increasing Demand of Near Infrared Absorbing Materials in Industrial Sector

In today's fast-paced industrial landscape, innovation is the driving force behind efficiency, productivity, and sustainability. Near Infrared (NIR) absorbing materials have emerged as unsung heroes in the quest for enhanced industrial processes. These materials possess unique properties that make them indispensable in various industrial applications. The industrial sector relies heavily on processes involving heating and drying, whether it's curing coatings, drying textiles, or processing food products. NIR absorbing materials have found a crucial role in optimizing these processes. By selectively absorbing NIR radiation, these materials can efficiently transfer heat to the target material, resulting in faster and more energy-efficient drying and curing processes. This not only improves productivity but also reduces energy consumption and operational costs, making NIR materials a sought-after solution for industries like manufacturing and textiles. In the quest for quality control and inspection, NIR absorbing materials have become instrumental. They are utilized in NIR spectroscopy, a non-destructive testing method that allows industries to analyze the composition and quality of materials in real-time. Industries such as pharmaceuticals, agriculture, and food processing rely on NIR spectroscopy to monitor product quality, optimize production processes, and ensure compliance with quality standards. The demand for NIR materials in quality control and inspection applications continues to rise as industries prioritize precision and consistency.

Moreover, the agriculture sector is undergoing a transformation driven by technology.

NIR absorbing materials play a pivotal role in this transformation, particularly in precision agriculture. NIR sensors and devices enable farmers to assess crop health, monitor nutrient levels in soil, and optimize irrigation practices. These materials allow for rapid and non-destructive analysis, enabling farmers to make data-driven decisions that improve crop yields, conserve resources, and reduce environmental impact. As agriculture faces the challenge of feeding a growing global population, the demand for NIR materials will continue to soar.

Furthermore, the pharmaceutical industry demands the utmost precision and consistency in manufacturing processes. NIR absorbing materials are employed in the pharmaceutical sector for real-time monitoring of drug formulations and quality control. NIR spectroscopy enables pharmaceutical manufacturers to analyze the composition of raw materials, monitor drug blending processes, and ensure the final product's integrity. The speed and accuracy of NIR technology reduces production downtime and enhances product quality, making NIR materials a staple in pharmaceutical manufacturing. In the era of heightened environmental awareness, industries are under increasing pressure to minimize their environmental footprint. NIR absorbing materials contribute to these efforts through applications in environmental monitoring and pollution control. Industries such as wastewater treatment and air quality management utilize NIR sensors to detect and analyze pollutants. These materials enable real-time monitoring and data collection, helping industries comply with environmental regulations and reduce their impact on the environment.

Rising Demand of Near Infrared Absorbing Materials in Defence & Security Sector

In an era marked by rapid technological advancements and evolving security challenges, the Defence & Security sector faces the relentless task of staying ahead of the curve. In this pursuit, Near Infrared (NIR) absorbing materials have emerged as invaluable assets, enabling cutting-edge innovations that enhance security, surveillance, and protection. Camouflage and stealth technology are vital components of modern military operations. NIR absorbing materials play a critical role in these applications by enabling military personnel and equipment to remain concealed from enemy detection systems. These materials absorb NIR radiation, which is often used in night vision devices and enemy surveillance. As military operations become increasingly dependent on covert tactics, the demand for NIR materials for camouflage and stealth technology continues to grow. NIR absorbing materials are instrumental in enhancing target identification and surveillance capabilities for defence and security purposes. NIR sensors and cameras equipped with these materials allow for improved visibility in low-light conditions, enabling military and law enforcement personnel to detect potential

threats with greater precision. Advanced NIR technology has found applications in border security, perimeter surveillance, and reconnaissance missions, bolstering national security efforts.

Moreover, the Defence & Security sector is witnessing a significant increase in the use of UAVs and drones for reconnaissance, surveillance, and intelligence-gathering missions. NIR sensors and cameras are integrated into these unmanned systems to capture high-resolution images and videos, even in low-light and nighttime conditions. NIR absorbing materials enhance the effectiveness of UAVs and drones, making them valuable assets for military and security agencies worldwide.

Furthermore, defence and security forces must be prepared to detect and respond to chemical and biological threats swiftly. NIR spectroscopy, facilitated by NIR absorbing materials, is employed to identify and analyze chemical and biological agents in real-time. These materials enhance the sensitivity and accuracy of detection systems, enabling timely responses to potential threats and minimizing the risk to personnel and civilians. Securing military bases, critical infrastructure, and government facilities is paramount. NIR absorbing materials are employed in advanced access control and perimeter security systems. Biometric sensors equipped with NIR technology enable secure authentication through facial recognition and vein pattern analysis. Additionally, NIR sensors can detect unauthorized intrusions based on body temperature and movement patterns, enhancing security protocols. NIR absorbing materials are instrumental in forensic science and crime scene investigation. They are used to identify and analyze bloodstains, gunshot residue, and other evidence with NIR spectroscopy. This technology expedites forensic analysis, aids in criminal investigations, and supports law enforcement agencies in solving complex cases. The demand for NIR materials in forensics and crime scene investigation is driven by the need for rapid and accurate evidence collection.

Key Market Challenges

Cost-Effective Manufacturing and Regulatory Compliance Poses a Significant Obstacle to Market Expansion

One of the primary challenges in the NIR absorbing materials market is the cost-effective manufacturing of these materials. Producing high-quality NIR absorbing pigments, coatings, or nanoparticles often involves complex processes and specialized materials, which can drive up production costs. Finding ways to reduce manufacturing costs while maintaining product quality is crucial to making NIR absorbing materials

more accessible to a wider range of industries and applications.

Moreover, as NIR absorbing materials find applications in critical sectors such as healthcare and food safety, they are subject to stringent regulatory requirements. Ensuring that NIR materials comply with regulatory standards, including safety and environmental regulations, can be a significant challenge. Companies in the NIR absorbing materials market must invest in research and development to meet these requirements and navigate the complex landscape of regulations.

Furthermore, the Near Infrared Absorbing Materials market is highly competitive, with numerous players vying for market share. This competition can lead to price wars and margin pressures, affecting profitability. Companies must continually innovate to differentiate their products and maintain a competitive edge.

Material Durability and Lifespan

For NIR absorbing materials to be effective in various applications, they must exhibit durability and a reasonable lifespan. This challenge is especially pertinent in sectors like construction, where NIR coatings and pigments must withstand harsh environmental conditions over extended periods. Developing materials that maintain their NIR properties under challenging conditions remains a priority for researchers and manufacturers.

Moreover, as the NIR absorbing materials market continues to grow, it becomes more competitive. Established players and new entrants are vying for market share, which can lead to price wars and margin pressures. Market saturation in some applications may also limit growth opportunities. To remain competitive, companies must innovate and differentiate their products while exploring new markets and applications.

Additionally, in applications where NIR absorbing materials are integrated into existing products or systems, compatibility issues can arise. Ensuring that NIR materials seamlessly integrate with other components without compromising performance or safety is a considerable challenge. This challenge is particularly relevant in industries like electronics, where the integration of NIR components into devices must not disrupt their functionality.

Key Market Trends

Rising Demand for Energy-Efficient Building Materials

One of the prominent trends in the NIR absorbing materials market is the increasing demand for energy-efficient building materials. NIR absorbing coatings and pigments are being incorporated into construction materials like paints and coatings. These materials help regulate indoor temperatures by reflecting NIR radiation, reducing the need for air conditioning during hot weather. This trend aligns with the growing emphasis on sustainable construction practices and energy conservation, especially in regions with extreme climates.

Moreover, the adoption of NIR absorbing materials is on the rise in the security and defense sectors. NIR-absorbing coatings and films are being used to camouflage military equipment and vehicles. By absorbing NIR wavelengths, these materials reduce the visibility of military assets under night vision surveillance, enhancing security in both military and civilian applications. As geopolitical tensions persist, the demand for NIR absorption technology is expected to grow further.

Advancements in Healthcare and Diagnostics

In the field of healthcare, NIR absorbing materials are making significant contributions to diagnostics and medical imaging. NIR-absorbing nanoparticles and dyes are being used to develop non-invasive imaging techniques, such as NIR spectroscopy and fluorescence imaging. These technologies enable healthcare professionals to visualize and analyze tissues, detect diseases, and monitor physiological processes more effectively. The ongoing research and development in this area are likely to lead to more precise and accessible diagnostic tools.

Moreover, the agriculture sector is also benefitting from the use of NIR absorbing materials. NIR spectroscopy is being employed to assess soil quality, monitor crop health, and optimize irrigation practices. Additionally, in the food industry, NIR technology is used for quality control and food safety testing. NIR-absorbing sensors can quickly analyze the composition of food products, ensuring they meet quality standards and regulatory requirements. As global food demand rises, the integration of NIR technology is expected to increase productivity and reduce waste in agriculture and food processing.

Environmental Monitoring and Remote Sensing

Environmental concerns are driving the use of NIR absorbing materials in monitoring and remote sensing applications. These materials are used in satellite and airborne

sensors to analyze land, water, and atmospheric conditions. By collecting data in the NIR spectrum, scientists can monitor changes in vegetation, identify pollution sources, and assess climate-related parameters. This trend is crucial for addressing environmental challenges and making informed decisions for sustainable resource management.

Furthermore, in the packaging industry, NIR absorbing films are gaining traction due to their ability to extend the shelf life of perishable goods. These films selectively absorb NIR radiation, which reduces the heating effect caused by sunlight on packaged products. As a result, food items and pharmaceuticals can remain fresher for longer periods, reducing food waste and preserving the efficacy of medicines. This trend aligns with the increasing focus on sustainability and reducing the environmental impact of packaging materials.

Segmental Insights

Material Insights

Based on the category of material, inorganic emerged as the dominant player in the global market for near infrared absorbing materials in 2022. Inorganic materials play a pivotal role in the near-infrared absorbing material market, with notable contributions from substances like antimony tin oxide (ATO), indium tin oxide (ITO), quantum dots, doped tungsten oxide, among others. These materials exhibit exceptional attributes that render them exceptionally well-suited for near-infrared absorption purposes. For instance, ATO and ITO are extensively utilized as transparent conductive coatings featuring near-infrared absorbing capabilities. This characteristic makes them exceptionally well-suited for various applications, including smart windows and optoelectronic devices, where their unique properties are harnessed effectively.

Function Insights

Based on the category of function, absorption emerged as the dominant player in the global market for near infrared absorbing materials in 2022. Absorption is a fundamental characteristic of near-infrared (NIR) absorbing materials, serving as a pivotal function that enables them to selectively take in light within the NIR spectrum. This function assumes critical significance in numerous applications where precise absorption of wavelengths is a primary objective. In the realm of photovoltaics, absorption holds paramount importance for the effective conversion of solar energy in solar cells. NIR absorbing materials are meticulously engineered to absorb a specific range of NIR

wavelengths, allowing them to capture a broader spectrum of solar radiation. By proficiently absorbing NIR light, these materials enhance their capacity to convert a more extensive portion of solar energy into electrical energy, consequently elevating the overall efficiency and performance of solar cells. In the domain of medical applications, NIR absorbing materials endowed with robust absorption characteristics find application in targeted therapies and imaging, facilitating precise and effective medical procedures.

Moreover, optical transparency is a fundamental characteristic of near-infrared (NIR) absorbing materials, serving as a vital function that facilitates the efficient transmission of NIR light. This exceptional transparency minimizes undesired scattering or reflection, making these materials ideal for seamless integration into optical systems, sensors, and devices where precise management of NIR wavelengths is a paramount requirement. The significance of this function is particularly pronounced in diverse applications where the accurate control and manipulation of NIR light holds critical importance.

End Use Industry Insights

Based on the category of end use industry, electronics & telecommunications emerged as the dominant player in the global market for Near Infrared Absorbing Materials in 2022. The Electronics & Telecommunications segment emerged as the dominant market share holder in the near-infrared absorbing materials market. Nonetheless, this sector is anticipated to exhibit the highest Compound Annual Rate (CAR) of growth in terms of value throughout the forecast period. The Electronics & Telecommunications industry is characterized by its dynamic and rapidly evolving nature, relying heavily on cutting-edge technologies and materials to meet the ever-growing demands of an interconnected global landscape. Within this industry, near-infrared absorbing materials assume a pivotal role, facilitating a diverse array of applications that significantly contribute to enhancing overall performance, functionality, and the end-user experience. The electronics and telecommunications sector stands as a vibrant and rapidly progressing industry that relies heavily on cutting-edge technologies and materials to meet the demands of our interconnected world. Within this industry, near-infrared absorbing materials assume a pivotal role, enabling a diverse range of applications that elevate performance, functionality, and overall user experience.

In the realm of electronics, near-infrared absorbing materials find valuable utility in the creation of optical filters. These filters are instrumental in selectively transmitting or obstructing specific wavelengths of light, leading to enhancements in image quality, glare reduction, and the overall clarity of displays and imaging equipment. As an illustrative example, organic dyes and polymers emerge as notable choices for

deploying color filters in liquid crystal displays (LCDs), achieving the objective of vibrant and precise color reproduction.

Regional Insights

North America emerged as the dominant player in the global Near Infrared Absorbing Materials market in 2022. The Near-Infrared Absorbing Material Market in North America is poised for rapid growth in the upcoming forecast period. The surging demand for energy-efficient solutions is a driving force behind the increased need for NIR absorbing materials in North America. The region places a strong emphasis on energy efficiency and sustainability in various applications. For instance, these materials find use in applications like smart windows and solar control films, effectively reducing solar heat gain and enhancing overall energy efficiency in buildings. Notable industry players operating within the North American region include Inframat Advanced Materials LLC, Epolin LLC, American Elements, and several others.

Moreover, on the other hand, Europe stands out as a significant region within the near-infrared absorbing material market, primarily due to its advanced technological infrastructure, robust manufacturing capabilities, and unwavering commitment to sustainability. This region boasts a rich tapestry of end-use industries that heavily rely on near-infrared absorbing materials.

Key Market Players

Sumitomo Metal Mining Co., Ltd.

Nanophase Technologies Corporation

Heraeus Holding

Keeling & Walker Ltd

Edmund Scientific Corporation

Nippon Shokubai Co., Ltd.

Resonac Holdings Corporation

Inframat Advanced Materials LLC

Epolin LLC

American Elements

Report Scope:

In this report, the Global Near Infrared Absorbing Materials Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Near Infrared Absorbing Materials Market, By Material:

Organic Materials

Inorganic Materials

Near Infrared Absorbing Materials Market, By Function:

High Transparency

Absorption

Heat Resistance

Near Infrared Absorbing Materials Market, By End Use Industry:

Electronics & Telecommunications

Industrial Sector

Defence & Security

Photovoltaics

Others

Near Infrared Absorbing Materials Market, By Region:

Asia-Pacific

China

India

Australia

Japan

South Korea

Europe

France

Germany

Spain

Italy

United Kingdom

North America

United States

Mexico

Canada

South America

Brazil

Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Near Infrared Absorbing Materials Market.

Available Customizations:

Global Near Infrared Absorbing Materials Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional market players (up to five).

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17.5.6. Nippon Shokubai Co., Ltd.

17.5.7. Resonac Holdings Corporation

17.5.8. Inframat Advanced Materials LLC

17.5.9. Epolin LLC

17.5.10. American Elements

18. STRATEGIC RECOMMENDATIONS

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