

# **Global Nanophotonics Market: Analysis By Product (LEDs, OLEDs, Near Field Optics, Photovoltaic Cells, Optical Amplifiers, Optical Switches, and Other), By Component (Quantum Dots, Plasmonics, Photonic Crystals, Nanotubes, Nanoribbons, and Other), By Application (Consumer Electronics & Entertainment, Telecommunication, Lighting, Indicators & Signs, and Others), By Region Size and Trends with Impact of COVID-19 and Forecast up to 2028**

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## **Abstracts**

The global nanophotonics market in 2022 stood at US\$15.00 billion, and is likely to reach US\$44.67 billion by 2028. Nanophotonics, an evolving field centered on manipulating light at the nanoscale, propels advancements in domains like telecommunications, data storage, and energy efficiency. This discipline's capacity for device miniaturization enhances accuracy in medical imaging, orchestrates targeted drug delivery, and boosts solar cell performance, driving innovation across a wide range of sectors.

The growing popularity with nanophotonics originates from its versatile advantages and extensive applications. Nanophotonics significantly enhances energy efficiency, contributes to sustainable practices, and meets the burgeoning needs of data-intensive sectors by improving data storage capacities. Nanophotonics revolutionizes healthcare through precise medical imaging, enhances connectivity with faster communication speeds, and drives innovation across sectors via efficient solar cells and device miniaturization. Importantly, nanophotonics lays the foundation for breakthrough technologies like quantum computing and integrated photonic circuits, asserting its

central role in ongoing technological progress. Thus, nanophotonics emerges as a transformative discipline with far-reaching potential to shape numerous fields' future. The global nanophotonics market is projected to grow at a CAGR of 19.95% during the forecast period of 2023-2028.

#### Market Segmentation Analysis:

**By Product:** The market report has segmented the global nanophotonics market can be divided into seven segments namely, LEDs, OLEDs, near field optics, photovoltaic cells, optical amplifiers, optical switches, and other. In 2022, the LEDs nanophotonics segment is the largest segment can be attributed to its wide array of applications, including high-resolution imaging, advanced communication systems, efficient light sources, and solar cells. Ongoing research and advancements in LED nanophotonics contribute to its growth and potential solutions for technological and environmental challenges, such as energy conservation and green technology development. The ability to control and manipulate light at the nanoscale enables the development of smaller, energy-efficient, and superior-performing devices, further driving the segment's dominance in the market. Further, the optical switches, during the forecasted period of 2023-2028, are expected to be the fastest-growing segment, owing to the unprecedented increase in data traffic from digital transformations, IoT proliferation, and the rollout of 5G networks.

**By Components:** Based on the components, the global nanophotonics market can be divided into six segments namely, quantum dots, plasmonics, photonic crystals, nanotubes, nanoribbons, and other. During the forecasted period of 2023-2028, the plasmonics segment of the market is expected to be the fastest-growing segment, owing to its potential for revolutionizing various industries. Plasmonics nanophotonics enables the miniaturization of optical components, enhances performance and efficiency, and offers advanced sensing and energy conversion technologies. The demand is driven by the increasing need for smaller and faster electronic and photonic components, as well as the demand for compact optical interconnects and high-speed data transmission in communication systems. Continuous advancements in plasmonics capabilities contribute to its significant impact and rapid market growth.

**By Application:** The global nanophotonics market can be divided into five segments, based on application, consumer electronics & entertainment, telecommunication, lighting, indicators & signs, and others. In 2022, the consumer electronics & entertainment nanophotonics segment is the largest segment, attributed to its ability to enhance energy efficiency, speed, and functionality in consumer electronics and

entertainment products. The segment caters to the growing demand for high-quality digital entertainment and electronic devices, enabling the creation of smaller, energy-saving, and high-performing products. The popularity of ultra-high-definition TVs, advanced processors, augmented/virtual reality devices, and high-capacity optical storage has surged in recent years, driving the dominance of consumer electronics & entertainment nanophotonics in the market. During 2023-2028, the telecommunication segment is poised to rapidly grow, largely due to the implementation of Telecommunication Nanophotonics, which optimizes data transmission, reliability, and energy efficiency, meeting the increasing needs for high-speed, high-bandwidth communication, especially with the evolution of 5G, IoT, cloud, and AI technologies.

**By Region:** According to this report, the global nanophotonics market can be divided into four major regions: Asia Pacific (China, Japan, South Korea, India, and Rest of Asia Pacific.), Europe (Germany, UK, France, Italy, Spain, and Rest of Europe), North America (The US, Canada, and Mexico), and Rest of the World. In 2022, Asia Pacific dominates the global nanophotonics market due to rapid industrial and tech advancements, diversified sectoral use, socio-economic growth, a shift towards energy-efficient nanophotonic LEDs and OLEDs, and increased internet penetration. Notably, these trends are amplified in electronics powerhouses like China, Japan, South Korea, and India. Further, China holds the largest share in the global nanophotonics market due to its thriving consumer electronics and semiconductor industries, which extensively utilize nanophotonics. This, combined with significant government investments in nanotechnology and photonics research and development, stimulates innovative applications across sectors such as telecommunications, healthcare, and energy.

The North America nanophotonics market is expected to grow at the fastest CAGR from 2023 to 2028, driven by continuous innovations by tech giants such as Apple, Google, and IBM, enhancing data storage, computing, and telecommunications. The region, globally recognized as a technological powerhouse, benefits from robust defense, aerospace, biotech, and pharmaceutical sectors, all increasingly utilizing nanophotonics. Also, the focus on sustainability and strict environmental regulations stimulate the renewable energy sector's interest in nanophotonics. The adoption of Industry 4.0 principles further heightens the technology's role in high-speed data transmission and energy-efficient devices, thus bolstering North America's nanophotonics market growth.

**Global Nanophotonics Market Dynamics:**

**Growth Drivers:** The telecommunications industry has seen a significant surge, driven

by the explosive rise in data traffic due to the spread of digital services and connected devices. This data boom necessitates advanced network infrastructure that can handle high-speed, high-capacity communication systems. Nanophotonics becomes crucial in this context, providing devices that can significantly boost the performance of optical communication systems. They offer higher data transfer rates and capacity while simultaneously curbing energy consumption. As such, nanophotonics has become an indispensable part of the telecommunications industry, which continuously seeks to cater to the escalating demand for efficient and reliable communication services, thereby fueling the expansion of the global nanophotonics market. Further, the market is expected to grow owing to growth of consumer electronics industry, rising demand for energy-efficient products, advancements in nanotechnology, increasing investments in R&D, etc. in recent years.

**Challenges:** Intellectual Property Rights (IPR) are vital in the rapidly evolving and innovative field of nanophotonics. However, securing sufficient IPR protection is a substantial challenge in the global nanophotonics market. The intricate patent landscapes in nanophotonics, due to consistent technological advancements, often prove difficult for smaller firms to navigate. Understanding the complex technicalities of the technology and legal details of patent laws requires significant resources and expertise. Complications from patent infringements, disputes, and litigations can introduce uncertainty into technology ownership and rights, hindering new product commercialization. Thus, IPR issues pose a significant challenge that the global nanophotonics market must overcome to promote innovation and competition. Additionally, other factors like high cost associated, etc. are other challenges to the market.

**Market Trends:** The emergence and progress of quantum computing are expected to significantly stimulate the global nanophotonics market between 2023 and 2028. Quantum computing necessitates quantum photonic systems, a domain in which nanophotonics is crucial. Nanophotonic devices, with their ability to precisely manipulate light at the nanoscale, facilitate efficient handling of quantum states of light. Advancements in nanophotonics are set to enhance the efficiency and security of quantum communication systems. The rising adoption of quantum computing thus presages an increased demand for nanophotonics, predicting substantial growth in the global nanophotonics market during the forecast period of 2023-2028. More trends in the market are believed to grow the nanophotonics market during the forecasted period, which may include advancements in Artificial Intelligence (AI) and Machine Learning (ML), expansion of 5G and beyond, smart cities and IoT, increased space exploration, climate change and sustainability concerns, rise of healthcare applications &

advancements in biotechnology, increased adoption in the automotive industry, advancement of integrated photonics, etc.

#### Impact Analysis of COVID-19 and Way Forward:

The global nanophotonics market experienced a slump due to COVID-19 disruptions, with economic turbulence and supply chain disturbances leading to manufacturing delays and fluctuating demand. However, a rebound was observed in the latter half of 2021, propelled by increased demand for nanophotonics in key sectors like telecommunications, healthcare, and consumer electronics. The pandemic's impacts were far-reaching, affecting inventory management, component sourcing, and pricing strategies, necessitating strategic recalibrations. Market resurgence was boosted by industries restarting operations, growing investments in nanophotonics, and changes in consumer behavior favoring essential services and hybrid consumption patterns.

Despite challenges, the crisis highlighted nanophotonics' critical role, possibly stimulating long-term demand and the industry's shift towards more localized and sustainable production models. The post-COVID impact on the nanophotonics market is expected to manifest in resilience and recovery, increased digital transformation driving demand, a stronger emphasis on environmental sustainability, and an influx of investment and innovation, presenting both challenges and opportunities for the sector.

#### Competitive Landscape and Recent Developments:

The global nanophotonics market is marked by its fragmented nature, with multiple major players such as Samsung, IBM, and LG Display in action. The companies have employed a range of strategies to maintain a competitive edge, such as fostering innovation through R&D and strategic alliances, illustrated by Philips' collaboration with imec for healthcare tech. Acquisitions, as seen with Lumentum Holdings Inc.'s acquisition of Coherent Inc., serve to fortify their market stance.

Further, key players in the nanophotonics market are:

Wolfspeed Inc.

Samsung SDI Co., Ltd. (Novaled GmbH)

ams OSRAM AG (OSRAM Opto Semiconductors GmbH)

Foxconn Technology Group (Sharp Corporation)

STMicroelectronics N.V.

Veeco Instruments Inc.

Oxford Instruments Plc (WITec Wissenschaftliche Instrumente und Technologie GmbH)  
Schott AG  
Lumileds Holding B.V.  
Nanosys, Inc.  
Headwall Photonics, Inc.  
Meta Materials Inc.

Companies in the global nanophotonics market are deeply invested in the research, development, manufacturing, and distribution of various nanophotonic components. These include LEDs, optical switches, optical amplifiers, and near-field optics, which are increasingly being used across a diverse range of sectors like telecommunications, consumer electronics, healthcare, and renewable energy. Their applications touch various aspects of digital and physical existence, making these components integral to technological advancement. With the rising demand, companies are introducing innovative solutions such as Nanoscribe's nanophotonics-utilizing 3D printer. Concurrently, they are expanding their geographic footprints to tap into new markets. For instance, Nano Dimension is a trailblazer in the sector, using industrial 3D printing of electronics for manufacturing. Further, RAYSHAPE is extending its 3D printer partnerships and resellers in Europe, establishing itself as a significant player in the region's resin 3D printing market. Formlabs and Hawk Ridge Systems have entered into a strategic partnership to expand digital fabrication tool access across North America. These activities are testament to the global nanophotonics market's dynamism, promising a transformative future.



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Table 1: 12. List of Companies and Their Nanophotonics-related Products

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