

Market Analysis

Semiconductor Market Overview:

According to the Global System for Mobile Communications (GSMA), the number of Internet of Things (IoT) connections - cellular and non-cellular both will enhance three-times globally between 2017 and 2025, and it will surpass the 25 billion mark[1], which is going to usher the demand for semiconductors. This resonates with the market size of semiconductors which was valued between \$420 billion to \$430 billion in 2018 by Industry ARC's market analyst. Furthermore, the analyst has estimated the demand for semiconductors to grow with a superlative CAGR of 10% to 12% during the forecast period of 2019 to 2025.

Owing to the growing number of mobile devices in countries such as China, India, Taiwan, and South Korea, stroking sublime growth in the consumer electronics sector, the APAC region held the maximum global semiconductor market share in 2018 which translated to 70% as of 2018, according to the findings by the market analyst.

Semiconductor Market Outlook:

Semiconductors such as silicon and germanium are materials that have an electrical conductivity that falls between conductors and insulators, and they are widely used in transistors. They also find applications in various sectors such as consumer electronics in telecommunication and other devices, energy, automotive, computing, and others. Their key application has been identified to be in the automotive sector which will observe a progressive CAGR of around 10% through to 2025 as projected by the market analyst.

"The future will observe a definite growth in the number of vehicles owing to the population growth and affordability, and it will be coupled with the nascent prevalence of electrical vehicles and autonomous trucks, which is going to create a humongous semiconductor marketplace," remarks the market expert in the market research report.

Semiconductor Market Growth Drivers:

The Penetration of Implantable Medical Devices in the Healthcare Sector-

In an indigenously generated report by the

American Association of Retired Persons (AARP), the market revenue of implantable medical devices was projected to be \$74 billion by 2018[2]. This resonates with the fact that medical devices have become indispensable for the healthcare delivery in all the countries as discussed in the fourth WHO Forum on Medical Devices that took place in Vishakhapatnam, Andhra Pradesh, India in December 2018. The main takeaway from the conference was that the number of medical devices across the globe will increase in the future. Now, medical devices are incorporated with semiconductor chips which are one of the major driving factors responsible for the semiconductor market growth.

The Artificial Intelligence Wave Stirring Semiconductors Sales -

With the advent of artificial intelligence and machine learning, AI chips have become a vital necessity. AI is creating a need for powerful semiconductor chips which can compute answers for large data sets. Apparently, the future will observe an upsurge in the number of machine learning applications which bring a subsequent heave in the semiconductor market size.

Data Storage Market driving the demand for Semiconductors -

According to the findings by the market analyst of Industry ARC, the data storage market was valued to be \$35 billion to \$40 billion in 2018, and the demand will shoot up with an astonishing CAGR of 18% to 22% during the forecast period of 2019 to 2025. Consequently, there will be an increase in the demand for semiconductors which will create a semiconductor market revenue avenue for the vendors.

Semiconductor Market Challenges:

Even though there is a discernible reduction in the manufacturing cost and a rapid increase in the demand for semiconductors, the technical concerns about the continuously changing functionality of semiconductor chips and peculiar demands from the end-users belonging to diverse sectors are becoming restraint factors in the semiconductor market. However, up-gradation in manufacturing techniques and investment in R&D to reinvent production strategies will be helpful to the vendors.



Semiconductor Market Key Players Perspective:

Global Semiconductor Alliance (GSA) had named NVIDIA Corporation as the most respected semiconductor company which had achieved more than \$5 billion sales. Other key players crusading for semiconductor market share are Intel, Samsung, Qualcomm, Broadcom, SK Hynix, Micron, TI, Toshiba, NXP, MediaTek, Western Digital, STMicroelectronics, Infineon, Sony, Renesas, Apple, and Analog Devices.

Semiconductor Market Trends:

In June 2018, China approved the \$44 billion merger between Qualcomm and NXP Semiconductor. In October 2018, Apple acquired a portion of Dialog Semiconductor for \$600 million after which the latter is expecting growth in revenues. Latest Development - In December 2018, Toshiba America Electronic Components, Inc. (TAEC) announced a new IC which is compliant with the Bluetooth Low Energy (LE) core specification. This development is going to spawn other companies to reinvent their product strategies in accordance with the current demand.

Semiconductor Market Research Scope:

The base year of the study is 2018, with forecast done up to 2025. The study presents a thorough analysis of the competitive landscape, taking into account the market shares of the leading companies. It also provides information on unit shipments. These provide the key market participants with the necessary business intelligence and help them understand the future of the semiconductor market. The assessment includes the forecast, an overview of the competitive structure, the market shares of the competitors, as well as the market trends, market demands, market drivers, market challenges, and product analysis. The market drivers and restraints have been assessed to fathom their impact over the forecast period. This report further identifies the key opportunities for growth while also detailing the key challenges and possible threats. The key areas of focus include the types of semiconductor market, and their specific applications in the networking & telecommunication, energy, automotive, computing, consumer electronics, sports & fitness, and other sectors.

Semiconductor Market Report: Industry Coverage

The report analyses the product demands by the type of product - intrinsic semiconductor and extrinsic semiconductor. The market is further segmented on the basis of components that include seals, filters, mass flow controllers, valves, and others and by instrument that include collection, monitoring, data measurement, and others.

Semiconductor market analysis provides a peek into the manufacturing methods that include water production, wafer fabrication, doping, masking, etching, and others.

The semiconductor market report also analyzes the major geographic regions as well as the major countries in these regions. The regions and countries covered in the study include:

North America: The U.S., Canada, Mexico

South America: Brazil, Venezuela, Argentina, Ecuador, Peru, Colombia, Costa Rica

Europe: The U.K., Germany, Italy, France, the Netherlands, Belgium, Spain, Denmark

APAC: China, Japan, Australia, South Korea, India, Taiwan, Malaysia, Hong Kong

Middle East and Africa: Israel, South Africa, Saudi Arabia

Global Optoelectronics Market Research Report – by component (LED, Laser diode, infrared component), a light source (ultraviolet, infrared, visible), industry (healthcare, automotive, telecommunication, consumer electronics) region – Forecast till 2023

Market Synopsis

Optoelectronics is a discipline that refers to the study, design, and manufacture of hardware devices which convert electrical signals into photon signals and vice versa. The light often includes invisible forms of radiation such as gamma rays, X-rays, ultraviolet and infrared, in addition to the visible light. In general, optoelectronic devices are electrical-to-optical or optical-to-electrical transducers or instruments that use light-based components in their operation. Optoelectronics is at a crossroad of optical-communication, optical-storage, and optical imaging industries. The cost of transmission is expected to reduce as the reach of internet and data centers expands.

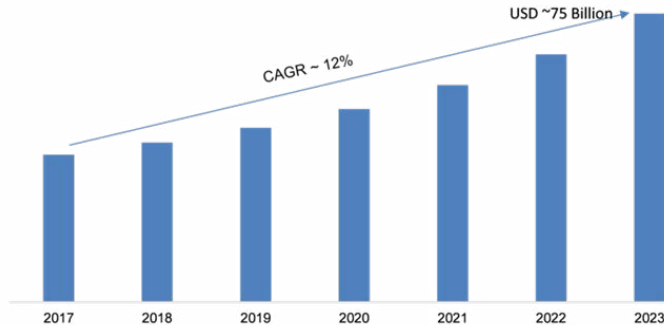
The increased use of infrared components in consumer electronics like cameras, thermal imaging systems, in automobile positioning sensors and many others are primarily driving the market for global optoelectronics. Also, the technological advancements in the area of LEDs are fuelling the market growth. However, high raw material cost and rapidly surfacing substitutes can threaten the market and hinder the growth.

In March 2018, Samsung Electronics, a global leader in digital component solutions has achieved the highest light efficacies for its fillet-enhanced chip-scale package LED line up - LM101B, LH181B, and LH231B. The LEDs are based on Samsung's CSP technology which is capable of building titanium oxide walls on the surface of the chip resulting direct light output. With chip's small form factor and reduced cross-talk, these devices can be deployed in spotlighting applications. The CSP LED differs from a normal LED in size, cost and emitting power. Samsung also made the LM101B series LEDs to mount on to other mid-power CSP LEDs easily, by modifying the electrode pad.

Segmentation

The global optoelectronics market is segmented

on the basis of the component, light source, industry, and region. On the basis of the component, the segment is further classified into LED, laser diodes, infrared components, optocouplers, image sensors, photovoltaic cells and many others. On the basis of the light source, the segment is further classified into ultraviolet, infrared, X-rays, and visible light. On the basis of industry, the segment is further classified into healthcare, automotive, telecommunication, consumer electronics, aerospace and defense and many others. On the basis of region, the market is studied for North America, Europe, Asia Pacific and rest of the world.



SOURCE: Company websites, annual reports, white papers, MRFR analysis

Global optoelectronics components market is estimated to reach USD 75 billion at CAGR 12% through the forecast period 2023

Regional Analysis

The global optoelectronics market is observed for North America, Europe, Asia Pacific and rest of the world. Asia Pacific region holds the major market share in global optoelectronics market and is expected to continue through the forecast period. The presence of major companies in the region and increased use of components in consumer electronics are driving the market in the region. The demand for optoelectronics in major regions like Japan, South Korea, and Taiwan are fuelling the market growth. North America holds a significant position in the global optoelectronics market. The low power consumption of optoelectronics and their durability are driving many organizations to deploy optoelectronics which is driving the market in this region. The key players are undergoing through various merger and acquisition and research activities to develop cost-effective product portfolio.

Some of the key players in the global optoelectronics market are Cree, Inc. (U.S.), Osram Licht AG (Germany), Vishay Intertechnology, Inc. (U.S.), ON Semiconductor (U.S.), OmniVision Technologies, Inc. (U.S.), Sony Corporation (Japan), Sharp Corporation (Japan), Samsung Electronics Co., Ltd. (South Korea), Koninklijke Philips N.V. (the Netherlands), General Electric Company (U.S.).

Some of the key innovators in the global optoelectronics market are Toshiba Corporation (Japan), Rohm Co., Ltd. (Japan), Panasonic Corporation (Japan), Finisar Corporation (U.S.), Avago Technologies, Ltd. (U.S.), Dialight Corp.(U.K), Merck KGaA (Germany), OSI Optoelectronics (U.S.), Texas Instruments (U.S.), NXP Semiconductors (the Netherlands), Analog Devices (U.S.), Taiwan Semiconductors (Taiwan), Fairchild Semiconductor International, Inc. (U.S.) and many

others.

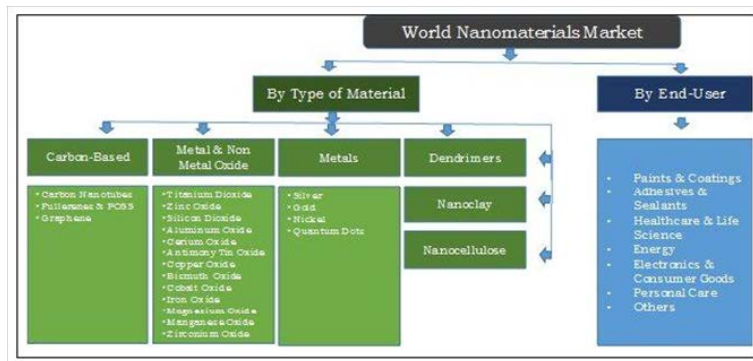
Nanomaterials Market Overview:

Nanomaterials Market was valued at \$14,741.6 million in 2015, and is expected to reach \$55,016 million by 2022, supported by a CAGR of 20.7%. Nanomaterials can be defined as the materials with at least one external dimension in the size range of approximately 1 to 100 nanometers.

The report focuses on current market trends and future growth opportunities of nanomaterials, in industries such as paints & coatings, adhesives & sealants, healthcare, energy, electronics & consumer goods, personal care, and others. It also emphasizes on various types of nanomaterials that are commercially available in the market, namely, carbon based (carbon nanotubes, fullerenes & POSS, and graphene), metal and non-metal oxides (titanium dioxide, zinc oxide, silicon dioxide, aluminum oxide, cerium oxide, antimony tin oxide, copper oxide, bismuth oxide, cobalt oxide, iron oxide, magnesium oxide, manganese oxide, and zirconium oxide), metals (silver, gold, nickel, and quantum dots), dendrimers, nanoclay, and nanocellulose. It also analyzes the current market trends of nanomaterials in different geographies and suggests the future growth opportunities by analyzing government regulations & policies, which can further increase the consumer acceptance in that region.

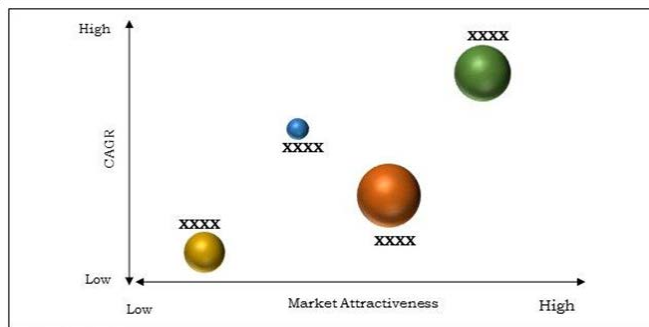
According to the perspective of leading companies, the factors that drive the demand for nanomaterials in various end-user industries are growing investment in research and development, increasing popularity of nanomaterials in various application industries, and the excellent physio-chemical properties of nanomaterials. Nanomaterials are usually added in small quantities to improve the performance of the base material. However, factors such as stringent environmental regulations and high price of nanomaterials may hamper the market growth. Currently, the paints & coatings, adhesives & sealants, electronics & consumer goods, and personal care segments are the major end-user markets for nanomaterials.

Global Nano materials Market Segmentation



Key players in the world nanomaterial market have adopted different business strategies such as capacity and business expansion, partnerships, mergers, acquisitions, and product & application development to survive in the global competitive market. The market players profiled in this report are nanomaterials manufacturers who either use it internally in some applications, or supply it to other end-users in the industry. The data pertaining to market players and their strategic moves are gathered through press releases of the respective companies, various blogs available on their websites, and primary calls made to the experts in the industry.

Top Investment Pockets



Source: AMR Analysis

Geographic Review:

Asia-Pacific is the most attractive market for the new entrants along with industry players on account of the increasing demand for nanomaterials. The growing number of industries and increased expenditure towards nanotechnology research is expected to provide significant opportunities to the industry players.

Nanomaterials is an extensively research & development based industry. Most of the nanomaterials commercially available in the market are at the initial stage of the product life cycle. Across the globe, industry players are investing significantly along with government institutions to find commercial applications for this wide range of nanomaterials. The Federal Budget, has recently allotted a total funding of more than \$1.4 billion for the National Nanotechnology Initiative (NNI), which is a U.S. Government research and development (R&D) initiative, for the year 2017; the total spending is around \$24 billion cumulatively, since the inception of NNI in 2001. Over the years many new and emerging applications for nanomaterials have been found with government funding and support such as in field emission display, body armors, water purification, drug delivery, bio fuel cell, wind turbine blades, and others

Emerging Trends in Nanomaterials Market



Source: AMR Analysis

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Type Segment Review:

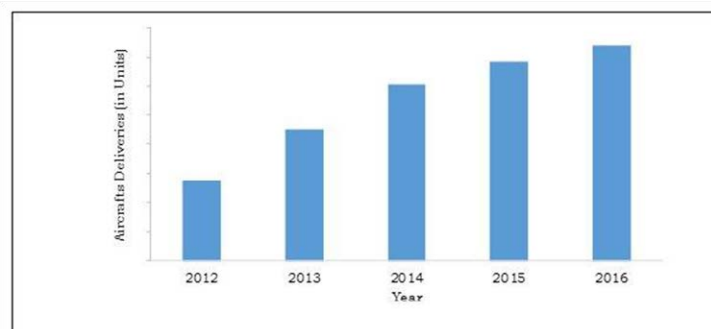
The carbon based nanomaterials segment includes fullerenes, graphene, and carbon nanotubes. It has become important due to its unique combinations of chemical & physical properties, which involve thermal conductivity, electrical conductivity, high mechanical strength, and optical properties. The unique physio-chemical properties of these materials has led to their utilization in various industrial applications, such as high-strength materials and electronics. Metal & non-metal oxides have a major role in many areas of chemistry, physics, and materials science. They are useful in various technological applications such as fabrication of microelectronic circuits, sensors, piezoelectric devices, fuel cells, coatings for the passivation of surfaces against corrosion, and as catalysts.

Dendrimers are tree-like molecules with well-defined cavities. They are defined by three components, namely, a central core, an interior dendritic structure (the branches), and an exterior surface with functional groups. Different combinations of these components generate differently shaped and sized products, with shielded interior cores that are meant for applications in both biological and materials sciences.

Application Segment Review:

In the aerospace industry, aircraft manufacturers are striving towards making aerospace parts stronger, tougher, and long-lasting. Recent research has revealed that nano-enabled products in aircrafts can increase fatigue life by 200 to 300%. Components fabricated with carbon nanotubes reinforced polymers can deliver improved mechanical, electrical, and thermal properties. Similarly, polymer-silicate nanocomposites can be used in fuel storage tanks. Increased commercial application of nanomaterials in the aerospace industry will provide significant opportunity to the material suppliers and part fabricators.

Global Aircraft Deliveries: 2012-2016



Source: AMR Analysis

Nanomaterials are meant for developing novel characteristics and have the potential to improve quality of life. However, these materials may also pose risks to the environment and raise health & safety concerns. Regulatory agencies are the governmental bodies that implement and enforce specific independent laws over some area of human activities. Thus, regulations of nanomaterials are mainly focused on their impact on human health and the environment. Regulatory bodies also check the hazardous wastes generated due to processing or manufacturing of nanomaterials. There are several regulatory bodies related

to nanomaterials such as EPA, TSCA, RCRA, NIOSH, CLP/GHS, REACH, and others.

Comprehensive competitive analysis and profiles of major market players such as Ahlstrom, Air Products and Chemicals Inc., Arkema Group, CNano Technologies Ltd., Daiken Chemicals, DuPont, Fuso Chemical Co., Ltd., MKnano, Nanoco, Nanocyl S.A., NanoIntegris, Nanophase Technologies Inc., Nanosys Inc., Southern Clay Products, Inc., TDA Research, and Umicore NanoMaterials are provided in this report.

NANOMATERIALS MARKET KEY BENEFITS

- Comprehensive analysis of factors that drive and restrict the growth of the global nanomaterials market is provided in the report.
- The projections in the report are based on the analysis of the current market trends and future market potential for the period of 2014-2022 in terms of value and volume.
- The segmentation of the nanomaterials market based on region is provided to understand the ongoing trends across various geographies.
- Exhaustive analysis of the world nanomaterial market by end user helps in understanding the penetration level of nanomaterials in various applications across different regions and countries.
- In-depth analyses of current research and developments in the nanomaterials is provided along with key market dynamic factors to understand the market dynamics.
- Extensive analysis of the market is conducted by following key product positioning and monitoring the top contenders in the market.
- Key players in the nanomaterials industry have been profiled in the report and their strategies have been analyzed thoroughly to understand the competitive outlook of the market.



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