Semiconductor Materials Market - Global Industry Size, Share, Trends, Opportunity, and Forecast
Segmented By Application (Fabrication, Process Chemicals, Photomasks, Electronic Gases, Photoresists Ancillaries, Sputtering Targets, and Silicon), By Packaging (Substrates, Lead Frames, Ceramic Packages, Bonding Wire, Encapsulation Resins and Die Attach Materials), By End-user Industry (Consumer Electronics, Telecommunication, Manufacturing, Automotive, and Energy and Utility) By Region, Competition 2018-2028

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Report description:

Global Semiconductor Materials Market has valued at USD 67.58 Billion in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 5.72% through 2028. Semiconductor materials are substances that exhibit a unique property of conductivity that lies between that of conductors (such as metals) and insulators (such as non-metals). These materials are a fundamental building block in the manufacturing of electronic devices and integrated circuits (ICs), commonly known as computer chips or microchips. They play a pivotal role in enabling the controlled flow of electrical current within electronic components. The behavior of semiconductor materials is based on their atomic structure and the presence of "band gaps" in their energy levels. In a semiconductor, the valence band (energy level occupied by electrons in their ground state) is separated from the conduction band (energy level that electrons can move into to become conducting). This gap requires an external energy source to be

bridged, allowing electrons to move from the valence band to the conduction band, thus conducting electricity.

Key Market Drivers

Due to new material and manufacturing innovations, semiconductors are shifting away from rigid substrates that are cut or shaped into tiny discs or wafers and towards more flexible plastic and paper. Numerous products, including light-emitting diodes, solar cells, and transistors, have been rendered feasible by the trend toward increasingly flexible substrates. Owing to this new material and fabrication innovation, the Global Semiconductor Materials Market is expected to register a high CAGR in the forecast period. New material and fabrication discoveries Fueling the market growth.

The demand for semiconductor materials is also anticipated to increase as the semiconductor industry's miniaturization trend gains traction. This is because manufacturing advanced node ICs, heterogeneous integration, and 3D memory architectures requires more processing steps, which leads to a rise in the consumption of wafer fabrication and packaging materials. For instance, a firm located in the UK called Pragmatic Semiconductor Ltd. revealed in December 2022 that it had collected USD 35 million from investors to create a novel method for manufacturing chips. The business owns a chip fabrication plant (also known as a fab) where flexible processors are produced. In particular, silicon is not present in the CPUs. A flexible processor called PlasticArm that uses metal-oxide transistors integrated on a plastic substrate was also presented by Pragmatic and Arm Ltd. the previous year.

Additionally, STMicroelectronics and French semiconductor material supplier Soitec announced in December 2022 over the following 18 months, they had reached the next stage of their collaboration on Silicon Carbide (SiC) substrates, with STMicroelectronics planning to qualify the SiC substrate technology from Soitec. The goal of this collaboration was for STMicroelectronics to utilise Soitec's SmartSiC technology for their upcoming 200mm substrate manufacturing, supporting the company's business for manufacturing devices and modules. Scale manufacturing is anticipated soon. More and more chips that enhance the power management of electric cars are currently being produced using the material SiC. The market for semiconductor materials in Europe is anticipated to increase rapidly over the course of the projected period because of rising investments in the latest technologies.

Additionally, the search for novel semiconductors that fit the requirements for photovoltaic devices has been prompted by the desire for low-cost, highly effective solar cells. Economic, ecological, chemical, and electrical qualities must be taken into consideration for large-scale applications. These include plentiful resources, ease of manufacture, particularly with thin-film technologies, long-term stability, and non-toxicity. All these criteria are satisfied by the transition metal dichalcogenides (TMDC) MoS_2 and WS_2, which have attracted a lot of interest recently. Moreover, the ongoing development of logic devices is currently driven by PPAC (Power Performance Area Cost) scaling and 3D integration issues, but significant advancements in the fabrication of wide bandgap materials are still required for the improvement of transport properties or for the improved thermal management of future power devices.

Rising Demand of Consumer Electronics

Consumer electronics represents one of the most significant end-user industries for the market. As such, the rising demand for consumer electronics, partly driven by the increasing adoption of the Internet of Things (IoT), unlocks new growth opportunities for the market. The internet of things (IoT) is a network of actual physical things and gadgets, such thermostats, refrigerators, and other things, that can be managed remotely. The use of the Internet of Things (IoT) is continuously increasing due to the expansion of high-speed connections, rising cloud usage, and growing applications of data processing and analytics. According to Ericsson Europe is a large IoT consumer. Although the region's IoT adoption is currently led by Germany, the United Kingdom, and the Netherlands, Eastern European nations. The Centre for the Promotion of Imports from Developing Countries (CBI) also estimates that European Internet of Things spending will reach USD 197.41 billion in 2021 and register double-digit growth through 2025. The increasing use of the Internet of Things is fueling demand for linked consumer electronics products. Since, people are adopting IoT in Consumer Electronics the demand of Semiconductor is increasing, due to which the requirement of Semiconductor Materials is growing rapidly in the forecast period.

Key Market Challenges

Environmental Regulations & Economic Volatility

The semiconductor industry is highly globalized and relies on complex supply chains. Any disruptions in the supply chain, such as

natural disasters, geopolitical tensions, or the COVID-19 pandemic, can lead to material shortages, increased lead times, and higher costs. As semiconductor manufacturing processes become more advanced, the materials used must meet increasingly stringent requirements. Developing materials that can meet these technical demands can be challenging and require significant research and development. The semiconductor industry is cost-sensitive, and manufacturers are constantly looking for ways to reduce production costs. This can put pressure on material suppliers to provide high-quality materials at competitive prices. The semiconductor manufacturing process often involves the use of hazardous materials and chemicals. Stringent environmental regulations and the need to minimize the environmental impact of production can create challenges for both material suppliers and semiconductor manufacturers. The semiconductor market is subject to economic cycles that can impact demand. During economic downturns, demand for electronic devices can decrease, affecting the demand for semiconductor materials.

Intellectual Property Protection

Developing new materials requires significant investment in research and development. Protecting intellectual property and preventing unauthorized copying or use of proprietary materials is an ongoing challenge. As semiconductor technology advances, there is a constant push for miniaturization and scaling. This requires materials that can maintain their performance and reliability at smaller scales, which can be technically challenging. The semiconductor industry evolves quickly, with new technologies and processes frequently emerging. Material suppliers must stay ahead of these changes to provide materials that are compatible with the latest manufacturing methods. The semiconductor materials market is highly competitive, with numerous companies vying for market share. This competition can lead to pricing pressures and the need for constant innovation. Semiconductor manufacturing involves intricate processes with tight tolerances. Materials must be consistent in quality and performance to ensure the yield of high-quality semiconductor devices.

Key Market Trends

Advanced Packaging Solutions

One of the most significant trends in the semiconductor industry is the relentless pursuit of miniaturization. As devices become smaller and more powerful, semiconductor materials must adapt to enable the manufacturing of intricate structures with ever-shrinking dimensions. This has led to the development of novel materials capable of maintaining their performance at nanoscale levels. Traditional semiconductor packaging techniques are evolving to accommodate the demands of new technologies like 5G, the Internet of Things (IoT), and artificial intelligence (AI). Advanced packaging methods such as 3D stacking and fan-out wafer-level packaging (FOWLP) are becoming more prevalent. These techniques require materials that offer improved thermal management, higher interconnect density, and enhanced reliability. As semiconductor technologies advance, the requirements for materials are becoming more complex. For instance, new materials are needed to support extreme ultraviolet (EUV) lithography, a cutting-edge manufacturing process used to produce smaller and more powerful chips. These materials must exhibit exceptional light absorption, thermal stability, and durability.

Wide Bandgap Semiconductors

Energy efficiency is a key concern in modern electronics. Semiconductor materials that can enable the development of energy-efficient devices are in high demand. This includes materials used in power semiconductors, which play a crucial role in renewable energy systems, electric vehicles, and other energy-saving applications. Wide bandgap materials like silicon carbide (SiC) and gallium nitride (GaN) are gaining prominence due to their superior electrical properties compared to traditional silicon. These materials are crucial for high-power and high-frequency applications, including power electronics and wireless communication systems. The semiconductor industry faces increasing scrutiny regarding its environmental impact. Manufacturers are seeking more sustainable materials and processes to reduce the industry's carbon footprint and minimize the use of hazardous substances. This has led to the development of eco-friendly materials and recycling initiatives.

Segmental Insights

Application Insights

The Semiconductor Materials Market is Process Chemicals dominated by the segment in 2022. Process Chemicals segment is dominating the market. The increase in operational fabrication capacity, the costly chemicals used by new technologies, as well as the processed silicon wafer surface area, all contribute to the consumption of semiconductor process chemicals. Less material is used per unit surface area of silicon wafers because of increased technological efficiency supplied by the semiconductor industry. The production of semiconductors uses processed chemicals for cleaning, developing, etching, and polishing. Additionally, the

production of semiconductors demands PFAS, a kind of fluorinated chemical used in semiconductor manufacturing. Due to its low surface tension and compatibility with other compounds, it is utilized mostly in imaging semiconductors gaining traction. Additionally, several companies are increasing their chemical manufacturing capacity to fulfill the need for semiconductor fabrication components.

End-user Industry Insights

Consumer Electronics is expected to dominate the market in the forecast period. One of the most significant scientific advancements in the consumer electronics sector is the development of semiconductor materials. The material is well-liked because of its excellent electron mobility, broad operating temperature range, and low energy requirements. The bulk of consumer gadgets contain semiconductors. Semiconductor parts including integrated circuits, diodes, and transistors are used in devices like microwaves, refrigerators, computers, gaming consoles, and mobile
Phones.

Regional Insights

The Asia Pacific region has established itself as the leader in the Global Semiconductor Materials Market with a significant revenue share in 2022 . The Chinese government's Made in China 2025 national strategic plan has been an important factor in the growth of the country's semiconductor industry. The central goal of the plan is the growth of the semiconductor industry. Also, the 2021 budget of the China National Intellectual Property Administration (CNIP) predicts 2 million applications per year until 2023, which is expected to drive the semiconductor market.

Key Market Players

o BASF SE.
o Indium Corporation.
o Intel Corporation.
o Hitachi Chemical Co. Ltd.
o KYOCERA Corporation
o Henkel AG & Company KGAA.
o Nichia Corporation
o Intel Corporation and UTAC Holdings Ltd
o International Quantum Epitaxy PLC

Report Scope:

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

? Global Semiconductor Materials Market, by Application:
o Fabrication
o Process Chemicals
o Photomasks
o Electronic Gases
o Photoresists Ancillaries
o Sputtering Targets
o Silicon
? Global Semiconductor Materials Market, by Packaging:
o Substrates
o Lead Frames
o Ceramic Packages
o Bonding Wire
o Encapsulation Resins (Liquid)
o Die Attach Materials
? Global Semiconductor Materials Market, by End User:

o Consumer Electronics
o Telecommunication
o Manufacturing
o Automotive
o Energy and Utility
o
? Global Semiconductor Materials Market, By Region:
o North America
? United States
? Canada
? Mexico
o Asia-Pacific
? China
? India
? Japan
? South Korea
? Indonesia
o Europe
? Germany
? United Kingdom
? France
? Russia
? Spain
o South America
? Brazil
? Argentina
o Middle East & Africa
? Saudi Arabia
? South Africa
? Egypt
? UAE
? Israel
Competitive Landscape
Company Profiles: Detailed analysis of the major companies present in the Global Semiconductor Materials Market.
Available Customizations:
Global Semiconductor 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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