

Superconducting Materials Market Report by Product Type (Low-temperature Superconducting Materials (LTS), High-temperature Superconducting Materials (HTS)), End Use Industry (Medical, Electronics, Energy, Defense, and Others), and Region 2024-2032

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Report description:

The global superconducting materials market size reached US\$ 1,241.8 Million in 2023. Looking forward, IMARC Group expects the market to reach US\$ 4,257.0 Million by 2032, exhibiting a growth rate (CAGR) of 14.2% during 2024-2032. The extensive applications of metallic compounds or alloys in consumer electronics and medical industries are primarily propelling the market.

Superconducting Materials Market Analysis:

- Major Market Drivers: The widespread product usage in improving the performance of smart grids is one of the key factors bolstering the market. Moreover, the escalating demand for materials that can be used in MRI equipment to diagnose several medical ailments, such as cardiovascular and musculoskeletal disorders, is also acting as another significant growth-inducing factor.
- Key Market Trends: Continuous technological innovations, including the introduction of high-temperature superconducting fibers, are among the emerging trends stimulating the market. In line with this, they produce optimal endurance power cables, which can transmit energy at enhanced speed and can be efficiently adopted in numerous storage systems.
- Competitive Landscape: Some of the prominent companies in the global market include American Superconductor Co., evico GmbH, Hitachi Ltd., Hyper Tech Research Inc., Metal Oxide Technologies, Inc., Siemens AG, Sumitomo Electric Industries Ltd., Superconductor Technologies Inc., SuperPower Inc. (The Furukawa Electric Co. Ltd.), and Western Superconducting Technologies Co. Ltd., among many others.
- Geographical Trends: Extensive R&D activities are catalyzing the market in North America. Additionally, the expansion of smart grids is also propelling the market in Asia Pacific. Besides this, the launch of favorable policies by government bodies in Europe is

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further contributing to the market. Moreover, the increasing infrastructure development activities will continue to bolster the market in the Middle East and Africa in the coming years.

-□Challenges and Opportunities: One of the primary challenges hindering the market is the high cost and complexity of production. However, the elevating investments in manufacturing techniques and materials research to achieve cost-effective and scalable solutions are projected to catalyze the market in the coming years.

Superconducting Materials Market Trends:

Improvements in Medical Imaging

Numerous advancements in medical imaging technologies, particularly magnetic resonance imaging (MRI), are stimulating the market, as superconducting materials are crucial in MRI machines due to their ability to create stable magnetic fields without significant power loss. For example, in October 2023, Bangalore-based Voxelgrids Innovations Private Limited developed the first MRI scanner produced in India that is characterized by various innovations, including bottom-up software design, avoiding reliance on scarcely available liquid helium, and customized hardware. Additionally, in January 2023, Imricor, one of the global leaders in real-time interventional cardiac magnetic resonance (iCMR) ablation products, entered into a Memorandum of Understanding (MOU) with GE HealthCare to introduce MRI systems that use superconducting magnets to provide high-resolution images with faster scan times. Apart from this, the rising emphasis of prominent players on enhancing the overall efficiency of healthcare services is anticipated to propel the market in the coming years. For instance, in June 2024, researchers from the King's Department of Engineering collaborated with the Japan Science and Technology Agency, the National Institute for Materials Science, the Tokyo University of Agriculture and Technology, and the Kyushu University to develop an iron-based superconducting magnet using AI for medical imaging machines. Furthermore, in May 2024, Siemens Healthineers invested approximately US\$250 Million in a new UK production facility aimed at manufacturing superconducting magnets to be used in MRI devices.

Extensive Research Activities

The increasing number of R&D activities for applications across industries, including electronics and defense, is bolstering the overall market. For instance, in December 2023, the Attoscience and Ultrafast Optics group introduced attosecond soft-X-ray absorption spectroscopy to study the composition of superconductive materials or substances. Similarly, in December 2023, Harvard researchers advanced superconductor technology by creating a high-temperature superconducting diode using cuprates. This development is crucial for quantum computing and represents a significant step in understanding exotic materials. Moreover, the inflating need for alloys to create the powerful magnetic fields needed to accelerate particles to high speeds is also contributing to the market growth. For example, in February 2024, a team of scientists in China launched a novel high-power microwave (HPM) weapon powered by a stirling engine and using superconducting materials. This innovation addresses the challenges of low efficiency and limited range faced by HPMs. Furthermore, the weapon's compact size and powerful capabilities make it crucial for turning off sensitive electronics.

Innovations in Quantum Computing

Superconducting qubits, which are the building blocks of quantum computers, usually rely on superconducting materials to perform complex calculations and maintain quantum coherence at high speeds. In March 2023, RIKEN and Fujitsu introduced 64-qubit superconducting quantum computers at the RIKEN RQC-Fujitsu Collaboration Center. Moreover, continuous advancements in material are further acting as significant growth-inducing factors. For example, in November 2023, Google DeepMind unveiled a novel AI tool called Graph Networks for Materials Exploration (GNoME) that uses two pipelines for discovering low-energy (stable) materials. Additionally, in February 2024, Multiverse Computing and Single Quantum, one of the providers of superconducting nanowire single-photon detectors, announced an industrial materials science R&D project under a US\$1.4 Million contract with the German Aerospace Center's Quantum Computing Initiative (DLR QCI) to enable quantum applications that outperform classical methods. In line with this, in February 2024, a team of researchers at Penn State unveiled superconducting materials that could provide the basis for more robust quantum computing.

Global Superconducting Materials Industry Segmentation:

IMARC Group provides an analysis of the key trends in each segment of the market, along with the superconducting materials market forecast at the global, regional, and country levels for 2024-2032. Our report has categorized the market based on the product type and end use industry.

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Breakup by Product Type:

- Low-temperature Superconducting Materials (LTS)
- High-temperature Superconducting Materials (HTS)

The report has provided a detailed breakup and analysis of the market based on the product type. This includes low-temperature superconducting materials (LTS) and high-temperature superconducting materials (HTS).

Low-temperature superconducting materials (LTS) and high-temperature superconducting materials (HTS) represent two key categories within the market, each with distinct characteristics and applications. LTS materials, such as niobium-titanium (NbTi) and niobium-tin (Nb₃Sn), require cooling to extremely low temperatures to achieve superconductivity. These materials are widely used in applications requiring strong, stable magnetic fields, such as in magnetic resonance imaging (MRI) machines and particle accelerators like the large hadron collider (LHC) at CERN. In contrast, HTS materials, including compounds like yttrium barium copper oxide (YBCO) and bismuth strontium calcium copper oxide (BSCCO), are more economical and practical coolants. In December 2023, Harvard researchers advanced superconductor technology by creating a high-temperature superconducting diode using cuprates. This development is crucial for quantum computing and represents a significant step in understanding exotic materials.

Breakup by End Use Industry:

- Medical
- Electronics
- Energy
- Defense
- Others

The report has provided a detailed breakup and analysis of the market based on the end use industry. This includes medical, electronics, energy, defense, and others.

The market is diversified across various end-use industries, each leveraging the unique properties of these materials to enhance performance and efficiency. In the medical sector, superconducting materials are essential for MRI systems, enabling the generation of high-resolution images crucial for accurate diagnostics. The electronics industry benefits from superconducting materials in the development of quantum computers. The energy sector sees significant applications of superconducting materials in power grids and renewable energy integration. In defense, they are utilized in advanced communication systems, high-sensitivity sensors, and electromagnetic weapons, offering strategic advantages through enhanced capabilities and reduced energy consumption. Other industries, including scientific research and transportation, also capitalize on superconducting materials for their ability to create powerful magnetic fields and enable groundbreaking technological advancements, such as in particle accelerators and maglev trains.

Breakup by Region:

- North America
 - o□United States
 - o□Canada
- Asia-Pacific
 - o□China
 - o□Japan
 - o□India
 - o□South Korea
 - o□Australia
 - o□Indonesia
 - o□Others
- Europe
 - o□Germany

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- o France
- o United Kingdom
- o Italy
- o Spain
- o Russia
- o Others
- Latin America
 - o Brazil
 - o Mexico
 - o Others
- Middle East and Africa

The market research report has also provided a comprehensive analysis of all the major regional markets, which include North America (the United States and Canada); Asia Pacific (China, Japan, India, South Korea, Australia, Indonesia, and others); Europe (Germany, France, the United Kingdom, Italy, Spain, Russia, and others); Latin America (Brazil, Mexico, and others); and the Middle East and Africa.

The market in Asia Pacific is driven by rapid advancements in technology and increasing investments in healthcare and energy infrastructures. For instance, Japan's RIKEN Center for Emergent Matter Science is a prominent leader in superconducting research. At the same time, China has made substantial investments in developing superconducting materials for power grids and high-speed maglev trains. Moreover, the wide presence of prominent players like General Electric (GE) Healthcare and Siemens Healthineers across North America, particularly in the United States, is also acting as a significant growth-inducing factor. Besides this, the rising integration of renewable energy resources is further bolstering the market in the Middle East and Africa. According to the IMARC, the Middle East renewable energy market size is projected to exhibit a growth rate (CAGR) of 13.53% during 2024-2032.

Competitive Landscape:

The market research report has provided a comprehensive analysis of the competitive landscape. Detailed profiles of all major market companies have also been provided. Some of the key players in the market include:

- American Superconductor Co.
- evico GmbH
- Hitachi Ltd.
- Hyper Tech Research Inc.
- Metal Oxide Technologies, Inc.
- Siemens AG
- Sumitomo Electric Industries Ltd.
- Superconductor Technologies Inc.
- SuperPower Inc. (The Furukawa Electric Co. Ltd.)
- Western Superconducting Technologies Co. Ltd.

(Please note that this is only a partial list of the key players, and the complete list is provided in the report.)

Superconducting Materials Market Recent Developments:

- June 2024: Researchers from the King's Department of Engineering collaborated with the Japan Science and Technology Agency, the National Institute for Materials Science, the Tokyo University of Agriculture and Technology, and Kyushu University to develop an iron-based superconducting magnet using AI for medical imaging machines.
- May 2024: Siemens Healthineers invested approximately US\$250 Million in a new UK production facility aimed at manufacturing superconducting magnets to be used in MRI devices.
- February 2024: A team of scientists in China introduced a novel high-power microwave (HPM) weapon powered by a stirling engine and adopting superconducting materials.

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Key Questions Answered in This Report:

- How has the global superconducting materials market performed so far, and how will it perform in the coming years?
- What has been the impact of COVID-19 on the global superconducting materials market?
- What are the key regional markets?
- What is the breakup of the market based on the product type?
- What is the breakup of the market based on the end use industry?
- What are the various stages in the value chain of the industry?
- What are the key driving factors and challenges in the industry?
- What is the structure of the global superconducting materials market, and who are the key players?
- What is the degree of competition in the industry?

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