

Printed Batteries Market Report by Voltage Range (Below 1.5 V, Between 1.5 V to 3 V, Above 3V), Product Type (Rechargeable, Non-Rechargeable), Application (Consumer Electronics, Energy Harvesting, Medical Devices, Smart Packaging, Smart Cards, Wearable Technology, and Others), and Region 2023-2028

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Abstracts

The global printed batteries market size reached US\$ 193.8 Million in 2022. Looking forward, IMARC Group expects the market to reach US\$ 1,706.6 Million by 2028, exhibiting a growth rate (CAGR) of 43.7% during 2022-2028. The supportive government initiatives and funding for research and development, the increasing demand for portable and on-the-go power solutions, and the rising product applications in automotive electronics and electric vehicles are some of the factors propelling the market.

Printed batteries are cutting-edge technology that involves fabricating batteries using printing techniques. These batteries are created by depositing conductive materials and active components onto various substrates using specialized printing processes like screen printing, inkjet printing, or roll-to-roll printing. This innovative approach allows for producing thin, flexible, and lightweight batteries with customizable shapes and sizes. These batteries hold significant promise for powering various electronic devices and wearable technologies due to their low-profile design and potential for integration into flexible surfaces. They also offer the advantage of cost-effectiveness and scalability, making large-scale production feasible. As research and development in this field continue to progress, printed batteries have the potential to revolutionize the electronics industry by enabling new applications and enhancing the efficiency and portability of electronic devices.

The global market is majorly driven by the increasing advancements in printing

technology. In line with this, the rising demand for wearable electronics is significantly contributing to the market. Furthermore, the growing adoption of Internet of Things (IoT) devices is positively influencing the market. Apart from this, the expanding applications in medical devices and the rise in demand for flexible and thin batteries are catalyzing the market. Moreover, the cost-effectiveness and scalability of printed batteries offer numerous opportunities for the market. The enhanced energy density and performance of printed batteries are propelling its demand. Besides, the escalating environmental concerns are driving interest in sustainable power solutions. Additionally, the increasing product integration into smart packaging for product tracking and authentication is providing a boost to the market.

Printed Batteries Market Trends/Drivers:

Increasing demand for low-power electronic devices in remote areas

The increasing demand for low-power electronic devices in remote areas is favorably impacting the market. In remote regions, where access to traditional power sources may be limited or unreliable, low-power electronic devices play a crucial role in various applications. Printed batteries offer a practical and efficient solution for powering these devices due to their lightweight, flexible, and portable nature. Remote monitoring systems, wireless sensors, and communication devices used in environmental monitoring, agriculture, wildlife tracking, and disaster management often require long-lasting and self-sustaining power sources. Printed batteries can be seamlessly integrated into these devices, providing a reliable and autonomous power supply without frequent battery replacements or complex wiring. Their ability to deliver power to low-energy consumption electronics for extended periods is a game-changer for remote operations, enabling continuous data collection and communication. Moreover, the batteries' cost-effectiveness and ease of production make them attractive for mass deployment in remote areas, fostering economic viability and sustainable development. As the demand for remote applications grows, the market is expected to expand substantially, addressing critical power needs in these remote and challenging environments.

Rising integration with flexible displays and electronic textiles

The rising product integration with flexible displays and electronic textiles is bolstering the market. As electronic devices become more compact, lightweight, and wearable, there is a growing demand for power solutions that seamlessly conform to these flexible surfaces. These batteries offer a perfect match for these applications due to their inherent flexibility and ability to be shaped into various form factors. By integrating with flexible displays, such as bendable screens in smartphones, e-readers, and wearable devices, these batteries enhance portability and user experience while eliminating the need for bulky and rigid power sources. Furthermore, electronic textiles or e-textiles, where clothing and fabrics are embedded with electronic components, play a pivotal

role. These batteries can be easily incorporated into the fabric without compromising comfort or aesthetics, providing a discreet and efficient power supply for wearable health monitors, smart clothing, and even military and communication gear. As the demand for flexible and wearable electronics continues to rise, the seamless integration of printed batteries with these innovative applications is expected to drive market growth and open up new possibilities for electronic devices that conform to the contours of daily lives.

Growing focus on miniaturization and lightweight electronics

The growing focus on miniaturization and lightweight electronics is fostering the market. As technology advances, there is an increasing demand for smaller, more portable electronic devices that offer high functionality without compromising performance. These batteries align perfectly with this trend as they can be fabricated in ultra-thin and lightweight forms, making them ideal power sources for miniaturized electronics. They can be designed to fit into the tiniest of spaces, enabling the creation of compact devices with reduced overall dimensions. Additionally, the lightweight nature of these batteries is particularly advantageous for wearable devices, portable gadgets, and handheld electronics. By shedding unnecessary weight and bulk associated with traditional battery technologies, these batteries enhance user comfort and convenience. Integrating printed batteries directly into electronic components further supports miniaturization efforts, streamlining the manufacturing process and reducing the device's overall size. With the electronics industry continuously pushing the boundaries of size and weight reduction, the market is expected to grow as a preferred power solution that complements the demand for miniaturization and lightweight electronics.

Printed Batteries Industry Segmentation:

IMARC Group provides an analysis of the key trends in each segment of the global printed batteries market report, along with forecasts at the global, regional and country levels from 2023-2028. Our report has categorized the market based on voltage range, product type and application.

Breakup by Voltage Range:

Below 1.5 V

Between 1.5 V to 3 V

Above 3V

Below 1.5 V dominates the market

The report has provided a detailed breakup and analysis of the market based on the voltage range. This includes below 1.5 V, between 1.5 V to 3 V, and above 3V.

According to the report, below 1.5 V represented the largest segment.

Batteries falling below the 1.5V category typically include button, coin, and rechargeable lithium-ion batteries. They are commonly used in small electronic devices such as watches, remote controls, hearing aids, and calculators. These low-voltage batteries are

preferred for their compact size and ability to power devices with minimal power requirements.

Furthermore, 1.5 V to 3 V encompasses a wide range of batteries, including popular alkaline batteries and primary lithium batteries. These batteries find use in various electronic devices, such as digital cameras, portable radios, toys, and handheld gaming devices. They provide a moderate power level suitable for devices that demand more energy than those in the sub-1.5 V range.

Moreover, batteries with an output voltage above 3 V typically include lithium-based batteries, such as lithium-ion, lithium-polymer, and some specialty batteries. These high-voltage batteries are commonly used in more power-hungry devices such as laptops, smartphones, power tools, and other portable electronics that require substantial energy capacity.

Breakup by Product Type:

Rechargeable

Non-Rechargeable

Rechargeable holds the largest share of the market

A detailed breakup and analysis of the market based on the product type have also been provided in the report. This includes rechargeable and non-rechargeable.

According to the report, rechargeable accounted for the largest market share.

Rechargeable batteries include batteries designed for multiple charge and discharge cycles. They are popular for their ability to be reused, reducing waste and long-term costs. Common rechargeable battery chemistries include lithium-ion (Li-ion), nickel-metal hydride (NiMH), and nickel-cadmium (NiCd). Rechargeable batteries find widespread use in portable electronics like smartphones, laptops, cameras, and electric vehicles. They are favored for their environmental friendliness and cost-effectiveness over time.

On the other hand, the non-rechargeable batteries are designed for single use only and cannot be recharged. Common non-rechargeable battery types include alkaline, zinc-carbon, and lithium primary batteries. They are often found in devices with low power consumption, such as remote controls, clocks, smoke detectors, and various disposable electronic gadgets.

Breakup by Application:

Consumer Electronics

Energy Harvesting

Medical Devices

Smart Packaging

Smart Cards

Wearable Technology

Others

Smart cards holds the largest share of the market

A detailed breakup and analysis of the market based on the application have also been provided in the report. This includes consumer electronics, energy harvesting, medical devices, smart packaging, smart cards, wearable technology, and others. According to the report, smart cards accounted for the largest market share.

Smart cards, including contact and contactless payment cards, are the largest application type driving the growth of the market. Printed batteries provide a compact and efficient power source for smart cards, supporting their functionalities such as data storage and communication. As a result, the rising adoption of contactless payment, IoT integration, identity and access management, and transportation systems contribute to the demand for printed batteries in smart cards application.

Consumer electronics, on the other hand, encompasses a wide range of portable electronic devices used in daily life, such as smartphones, tablets, laptops, digital cameras, wearables, and gaming consoles. These devices rely on various types of batteries, including lithium-ion, lithium-polymer, and alkaline batteries, to power their functionalities efficiently and provide long-lasting energy for seamless user experiences. Furthermore, energy harvesting involves using batteries with energy harvesting technologies, such as solar panels, piezoelectric systems, or thermoelectric generators. These batteries store the harvested energy for later use in wireless sensors, remote monitoring devices, and low-power electronics, reducing the dependence on traditional power sources and enabling self-sufficient and environmentally friendly solutions. Moreover, batteries play a critical role in powering medical devices, from simple medical instruments like thermometers and blood glucose monitors to more advanced equipment such as pacemakers, defibrillators, and implantable medical devices. Reliability and long life are crucial in this segment, making rechargeable lithium-ion and primary lithium batteries commonly used to ensure medical devices' continuous and safe operation.

Breakup by Region:

North America

United States

Canada

Asia Pacific

China

Japan

India

South Korea

Australia

Indonesia

Others

Europe
Germany
France
United Kingdom
Italy
Spain
Russia
Others
Latin America
Brazil
Mexico
Others

Middle East and Africa

North America exhibits a clear dominance, accounting for the largest printed batteries market share

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

The North American market is characterized by its technologically advanced economies, high disposable income, and a strong focus on sustainability and environmental regulations. In this region, there is a growing demand for batteries that support the rapid expansion of electric vehicles (EVs), renewable energy storage solutions, and smart grid applications. Additionally, consumer electronics, medical devices, and industrial sectors drive the need for high-performance batteries.

Furthermore, the Asia Pacific region is also a significant player in the market. The region's expanding electronics industry, coupled with the increasing adoption of electric vehicles and energy storage systems, fuels the product demand. The region also benefits from the presence of major battery manufacturers and suppliers and favorable government initiatives to promote green energy and electric mobility.

Competitive Landscape:

Top printed batteries companies are actively contributing to the market growth by harnessing innovative technologies and strategic initiatives. Through extensive research and development, these companies are pushing the boundaries of printed battery capabilities, enabling the creation of flexible and lightweight power sources. These firms are investing in cutting-edge materials and manufacturing processes, optimizing battery performance and reliability. They are collaborating with diverse industries to integrate

printed batteries into a wide range of products, including wearables, medical devices, and Internet of Things (IoT) applications. Moreover, these companies are focused on scaling production capacities to meet the increasing demand for eco-friendly and cost-effective energy solutions. By adhering to sustainability practices and adhering to stringent quality standards, they instill consumer confidence and expand the market for printed batteries globally.

The report has provided a comprehensive analysis of the competitive landscape in the printed batteries market. Detailed profiles of all major companies have also been provided.

Blue Spark Technologies Inc.

BrightVolt Solid State Batteries

Enfucell Oy

FLEXEL LLC

Imprint Energy Inc.

NEC Corporation

Planar Energy Devices Inc.

Samsung SDI Co. Ltd.

Xymox Technologies Inc.

Recent Developments:

In 2020, BrightVolt announced a partnership with Bridgestone Corporation to collaborate on developing and commercializing next-generation solid-state batteries for various applications, including automotive and IoT devices. The collaboration aimed to leverage BrightVolt's expertise in solid-state battery technology and Bridgestone's capabilities in material science and manufacturing.

In 2022, Imprint Energy launched its latest generation of zinc-based battery technology, called ZinCore. The battery offers improved portable power and is suitable for IoT product design and mobile connectivity. ZinCore batteries provide 10x more power in the same volume compared to previous zinc-based batteries and can withstand extreme temperatures. They are also thinner, more flexible, and customizable, making them suitable for various applications such as smart labels, medical devices, and IoT wearables.

In 2023, Samsung SDI and Stellantis announced plans to build a second battery manufacturing facility in the United States under their joint venture, StarPlus Energy. The new plant is expected to start production in 2027 with an initial annual production capacity of 34 gigawatt hours (GWh).

Key Questions Answered in This Report:

How has the global printed batteries market performed so far, and how will it perform in the coming years?

What are the drivers, restraints, and opportunities in the global printed batteries market?

What is the impact of each driver, restraint, and opportunity on the global printed batteries market?

What are the key regional markets?

Which countries represent the most attractive printed batteries market?

What is the breakup of the market based on the voltage range?

Which is the most attractive voltage range in the global printed batteries market?

What is the breakup of the market based on product type?

Which is the most attractive product type in the global printed batteries market?

What is the breakup of the market based on the application?

Which is the most attractive application in the global printed batteries market?

What is the competitive structure of the global printed batteries market?

Who are the key players/companies in the global printed batteries market?

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