LUCINTEL INSIGHT
OCTOBER 2021

FIVE TRENDS SHAPING THE FUTURE OF THE SUPERCAPACITOR MARKET

Technologies in the supercapacitor market have undergone significant changes in recent years, with supercapacitors evolving from low capacitance to high capacitance. The rising wave of new technologies such as flexible supercapacitors, micro-supercapacitors, and hybrid supercapacitors is creating significant potential in various transportation, consumer electronic, industrial, and energy sectors. The major growth drivers for this market are the increasing

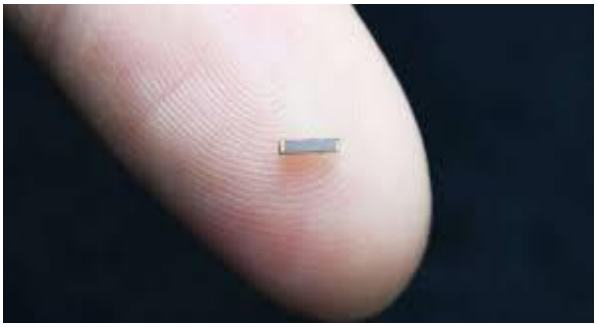
production of electric vehicles, growth in portable electronics, and superior properties of supercapacitors in comparison to conventional power storage devices, such as high energy density, long lifecycles, and power stabilization.

The supercapacitor market is divided into several segments, such as double layer capacitors, pseudocapacitors, and hybrid capacitors. Key players in the supercapacitor market include Maxwell, Panasonic, Ioxus, AVX, Skeleton Technologies, CAP XX, Nippon Chemi-Con, LS Mtron, and Evans Capacitor. These have been working on different strategies to drive sales using highly influential marketing approaches; however, as we examine the challenges and opportunities ahead in this market, companies can benefit from a strategy of developing micro-supercapacitors and hybrid supercapacitors, as well as considering the key target market trends we have identified. Lucintel predicts the global supercapacitor market will be valued at $3.5 billion by 2025, with an expected CAGR of approx. 20.0% between 2020 and 2025.

Lucintel reveals five trends set to influence the global supercapacitor market. Most of the industry players and experts agree that these five trends will accelerate developments in the supercapacitor industry in the near future. In terms of the widespread knowledge about the supercapacitor market already on the horizon, there is still a lack of unified perspective on the direction the industry is moving to proactively address developments. To help bring more clarity to this gap, our study aims to provide insights concerning the direction that changes are taking and how these changes will impact the supercapacitor market.

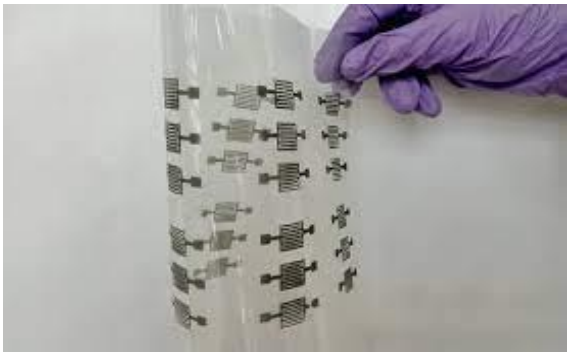
1. Growing Demand for Micro-Supercapacitors

Micro-supercapacitors possess remarkable features of high mechanical and electrochemical properties and can work for an extremely long period of time with only a small capacitance attenuation. They can be charged very quickly, and they hold a large



amount of energy for a long time. In recent years, tremendous effort has been put into the design and fabrication of MSCs with different active electrode materials, including carbon-based materials, conducting polymers, and graphene/metal oxide composites. Micro-supercapacitors provide a legitimate option for various applications ranging from mobile electronics to wireless autonomous sensor networks.

2. Flexible Supercapacitors



Flexible supercapacitors show great potential for applications in wearable, miniaturized, portable, and flexible consumer electronics. Flexible supercapacitors are highly attractive as they combine inherent high power density, a longer operation lifetime, fast charging/discharging capability, and mechanical flexibility. The distinct characteristic of flexible supercapacitors is the incorporation of flexible electrode or substrate material to combine structural flexibility with the inherently high power density of supercapacitors.

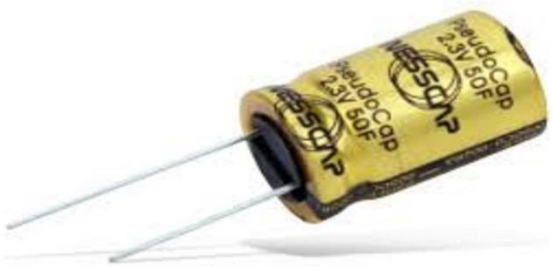
3. Growing Hybrid Supercapacitors

Hybrid supercapacitors combine the underlying structures of both batteries and supercapacitors in one physical unit. These hybrid components are not just a simple packaging of a distinct battery and supercapacitor pair in a common housing. Rather, they are energy sources that merge the chemistry of a battery with the physics of a supercapacitor in a single structure. Hybrid supercapacitors have higher operating voltage (3.8 V maximum) and much higher capacitance and energy density (up to 10 times) than symmetric supercapacitors. They also

have much lower self-discharge and standby current. Hybrid supercapacitors cannot be fully discharged. A hybrid supercapacitor uses an anode made from graphite laced with lithium and a different electrolyte. Hybrid supercapacitors do not pose any risk of fire or thermal runaway.

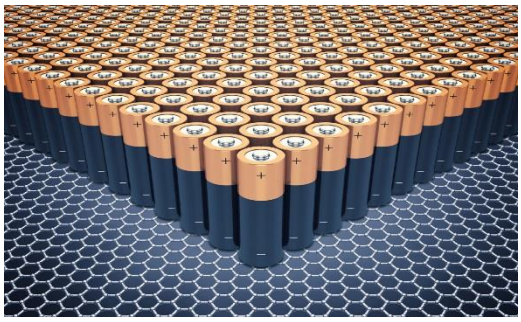
4. Development of Pseudocapacitors

A pseudocapacitor is a hybrid between a battery and an electric double layer capacitor. It also consists of two electrodes separated by an electrolyte. Charge storage is enabled by chemical and electrostatic means. The chemical process involves charge transfer by means of reduction-oxidation (redox) reactions. While the charge transfer is similar to that in a battery, transfer rates are higher because of the use of thinner redox material on the electrode or lower penetration of the ions from the electrolyte into the structure. Because of multiple processes acting to store the charge, the capacitance values are higher in pseudocapacitors.



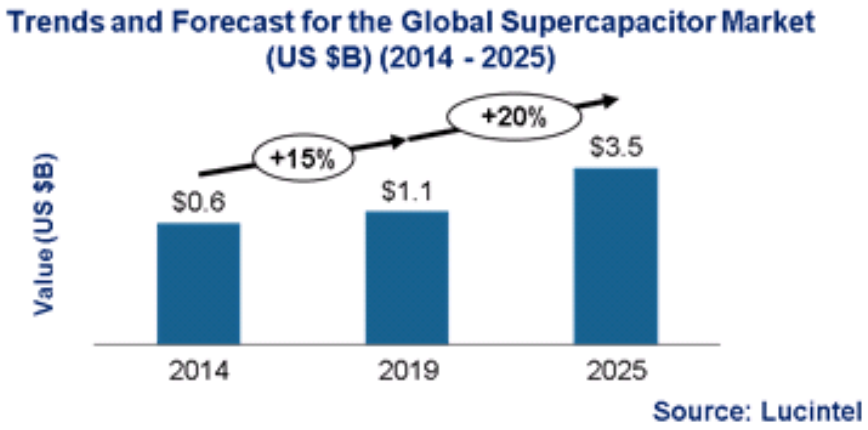
5. Development of High Energy Density Supercapacitors

Supercapacitors are useful for intense burst power supply, but have difficulty delivering steady power over a long period of time, for example to run a laptop or an engine. Researchers have begun developing high energy density supercapacitors by using graphene to increase the electrode's surface area so that it can store more energy for longer. There is growing demand for high energy capacitors because of their unique properties, such as high capacitance density, lower-cost farad, long lifecycle, and use as a more reliable and long-life substitute compared to conventional batteries.



Strategic Considerations for Key Players in the Supercapacitor Market

The supercapacitor industry is dynamic and ever-changing. Successful industry players are necessarily masters of innovation, change and adaptation. To retain this status, they need to be attentive to current trends. We believe there will be promising opportunities for supercapacitors in the transportation, industrial, consumer electronic, and energy industries. As per Lucintel's latest market research report (Source: https://www.lucintel.com/supercapacitor-market.aspx), the supercapacitor market is expected to grow with a CAGR of approx. 20.0% between 2020 and 2025, and reach $3.5 billion by 2025. This market is primarily driven by the increasing production of electric vehicles, growth in portable electronics, and the superior properties of supercapacitors in comparison to conventional power storage devices, such as high energy density, long lifecycle, and power stabilization.



Whether you are new to the supercapacitor market or an experienced player, it is important to understand the trends that impact the development process, as these trends as listed above will lead players to create long-term strategy formulation that will allow them to remain competitive and successful in the long run. For example, to capture growth, some of the strategic considerations for players in the supercapacitor market are as follows:

- Supercapacitor market players can increase their capabilities to develop micro-supercapacitors for energy storage in micro-devices.
- Players can focus on flexible supercapacitors, where inherent high power density is expected to lead future trends.
- Investment to increase competencies for the development of hybrid supercapacitors with higher capacitance and energy density
- Research and development activities for development of low-cost supercapacitors.

Note: In order to gain better understanding, and learn more about the scope, benefits, and companies researched, as well as other details in the supercapacitor market report from Lucintel, click on https://www.lucintel.com/supercapacitor-market.aspx. This comprehensive report provides you with in-depth analysis on market trends and forecast, segment analysis, regional analysis, competitive benchmarking and company profiling of key players. In addition, we also offer **strategic growth consulting** to meet your customized needs. We have worked with many PE firms and corporate customers in the process of their market entry and M & A initiatives.

Lucintel - At a Glance

- **Premier management consulting and market research firm. Founded in 1998.**
- **Deep global insights into major industries. Team of over 120 analysts / consultants across globe**
- **Management comprised of PhDs, MBAs, and subject matter experts. Head quarter in Dallas, USA.**

Conducted 500+ consulting projects across industries for 3M, Audi, Dupont, Carlyle, GE, etc.

Consulting Services

Why Lucintel

Trusted insights: Reliable insights. Widely cited in Wall Street Journal, Financial Times, Forbes, etc.

Clients we serve: Over 1000 clients from 70 countries – Fortune 500 companies

Strategic advice: Over 20 years of proven global strategic management consulting experience

Industries Served

Contact Us

Sanjay Mazumdar, Ph.D.
CEO, Author, & Strategist
Email: sanjay.mazumdar@Lucintel.com
Tel.: 972-636-5056

Eric Dahl
Senior Executive Advisor
Email: eric.dahl@lucintel.com
Tel.: +1-323-388-6971

Brandon Fitzgerald
Director of Client Engagement
Email: brandon.fitzgerald@lucintel.com
Tel.: +1-303-775-0751

Tushita Roy
Senior Manager-Client Engagement
Email: tushita.roy@lucintel.com
Tel.: +31-6-82270883