PRESS RELEASE

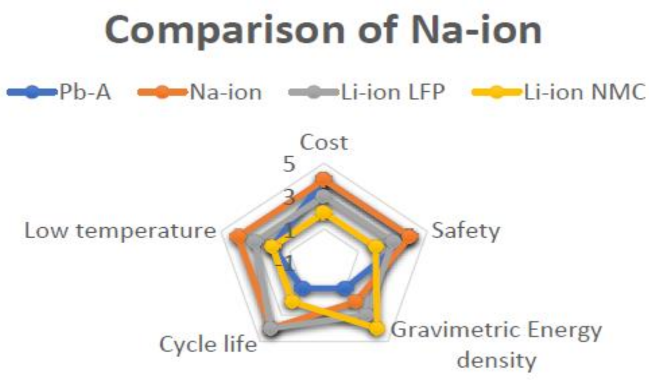
Technical article e-mobility tec

Sodium-ion battery cell technology in e-mobility?

Karlstein am Main, March 11, 2024 – *One of the greatest challenges of our time is man-made climate change. There is no question that this trend must be mitigated through an accelerated energy and transport transition. In comparison to combustion vehicles, E-mobility protects the environment in two ways: a) no emissions, and b) no noise pollution. Due to their unrivaled energy density, lithium-ion battery systems are the preferred choice in e-mobility. Today, the demand for e-mobility solutions is quite literally exploding. Experts estimate that between 2,500 and 3,500 GWh of additional battery storage capacity per year will be needed in 2030, mainly due to the electrification of the private transport sector[1]. The rapid pace of electrification not only affects passenger transport, but also various other e-mobility applications that operate continuously, such as sweepers in public spaces as well as all kinds of construction site vehicles and agricultural vehicles that are switching to the new mobility. With this increasing demand, investments by manufacturers into battery cell technology R&D are also on the rise. At the moment, the sodium-ion cell technology is experiencing a renaissance. The article highlights the potential of the hyped cell chemistry for e-mobility applications and compares its strengths and weaknesses with those of the currently leading lithium-ion technology.*

Felix Reidelbach has degrees in engineering and international sales. With many years of sales experience in management positions at various companies, he has been helming the TerraE business unit of the BMZ Group, a globally renowned specialists in lithium-ion and sodium-ion battery production, since the beginning of 2024. The primary focus of his business unit is on technology, production, and sales. It is renown for the TerraE (lithium-ion battery cells) and NaTE (sodium-ion battery cells) brands.

Will sodium-ion battery cell technology shape the future of e-mobility? To answer this question, it is important to first take a look at the five factors that are used to assess the cell chemistry of a battery cell for compatibility with the respective requirements of a battery solution for a specific application.



[1] Background report on sodium-ion batteries 2023, Fraunhofer, page 7

A battery's life cycle data provides information about how many charging and discharging cycles a battery can sustain before its performance drops significantly. The number of these cycles depends on various factors, such as the temperature at which charging and discharging takes place, as well as the cell chemistry. The sodium-ion cell chemistry achieves a significantly greater number of cycles than the lithium-ion cell technology.

Their susceptibility to low-temperature applications can also be a more or less relevant criterion in the selection of a suitable cell chemistry, depending on the application. For an electrified snow plow, for example, it is critical for the battery to be able to handle low temperatures. The sodium-ion cell chemistry also outperforms the lithium-ion cell chemistry in the low temperature spectrum, as the charge of a lithium-ion battery drops significantly faster at low temperatures than when used in warm climates. While sodium-ion batteries also discharge faster in cold climates compared to warm climates, the difference is much smaller.

It is important to note that no battery technology is completely free of risks, although the highest safety standards are observed, especially for products developed in Germany and Europe.
According to general scientific consensus, the sodium-ion battery cell technology is considered superior to lithium-ion battery cell technology in terms of safety.
The reason for this is the higher thermal stability, which means that sodium-ion batteries react more slowly to overheating and thermal stress, which renders them safer.
Sodium-ion battery cells are less prone to spontaneous combustion and are less explosive.
Moreover, sodium-ion battery cells generally contain fewer toxic and flammable components than lithium-ion battery cells.
Sodium-ion battery cells are also less sensitive to overvoltages than lithium-ion battery cells.
In addition, sodium-ion battery cells are less prone to dendrite formation and therefore have a lower risk of short circuits than lithium-ion battery cells.
Furthermore, deep discharging does not adversely affect sodium-ion cells. This is a major advantage in terms of user-friendliness, especially in the private sector in cases where devices are only used once or twice a year, as there is no damage to the battery if the device is left lying around for a longer period of time without anyone checking the charge level. With today's most widely used lithium-ion battery cell technology, batteries are often deep-discharged due to infrequent use, which renders them defective.2

The sodium-ion battery cell technology also outperforms the lithium-ion battery cell technology in terms of price. Lithium is a rare element and is expensive to mine, while sodium is widely available and inexpensive3. What's more, lithium-ion battery cells are also more difficult and expensive to produce. And the lithium-ion battery cell technology is also well established in a wide range of applications, which means that they are in demand, thus driving up the price even further.

When it comes to energy density, the lithium-ion battery cell technology currently soundly beats the sodium-ion battery cell technology. This is due to the properties of the atoms. Lithium has a lower atomic weight than sodium. In addition, lithium has a more efficient electron transfer and forms more stable bonds with electrode materials than sodium. Lithium-ion battery cells can also use thinner electrodes and electrolytes than sodium-ion battery cells. Moreover, the lithium-ion battery cell

[2] Joule commentary, page 1619
[3] Background report on sodium-ion batteries 2023, Fraunhofer, page 17

technology is more widely used and enjoys a vaster R&D infrastructure and greater industrial support. These factors have brought about significant technological improvements in recent years, which have also been reflected in an increase in energy density. This trajectory still lies ahead for the sodium-ion battery cell technology, which has only recently garnered attention and is considered to have great potential. But even today, there are already sodium-ion battery cells that have similar energy densities compared to LFP cells. The sodium-ion battery cell technology currently cannot match the energy density of NMC lithium-ion battery cells. As things stand today, it can therefore be roughly summarized that lithium-ion battery cells deliver X amount of energy while taking up less space and weighing less than sodium-ion battery cells.
Nevertheless, this disadvantage is not as significant in certain applications and can even be used to advantage, as the battery modules are simply installed as counterweights in the application instead of the required counterweights, thus compensating for the actual disadvantage.

It can therefore be concluded that although the sodium-ion battery cell technology offers more advantages than the lithium-ion battery cell technology, it falls short when it comes to the installation space/space requirement factor, which is often decisive in e-mobility. Lithium-ion technology will therefore remain the leading battery cell technology in e-mobility for the time being, particularly in the area of private passenger transportation. In other e-mobility applications where space and weight are less critical factors, such as harbor cranes or large agricultural vehicles and large excavators, the first applications for sodium-ion battery cell technology are expected in the near future.

But when it comes to e-mobility, it’s not just about the electric vehicles themselves. For a successful change in transport, we also need the right charging infrastructure. With a view to self-sufficiency and cost optimization, the acquisition and use of a photovoltaic system with industrial storage and an integrated wallbox is an ideal overall package to round off electromobility for agricultural businesses, the construction industry, road maintenance depots, and many other industries. Especially for the construction industry, transportable container solutions such as POWER BLOXX, which can be delivered complete with wallbox and ideally equipped with their own photovoltaic modules on the roof and integrated inverter, are of particular interest with regard to industrial storage systems. With industrial storage systems, the space requirement is often not a critical factor. Research is therefore already underway, e.g., at BMZ, on initial customer projects for the use of sodium-ion battery cell technology.

There is no doubt that regulations on emission protection in urban areas will be tightened in the coming years. Electrification in commercial e-mobility will therefore continue to make rapid advances. As the space requirements of the battery are often not an issue in these applications, sodium-ion battery cell technology is the perfect solution for many of today's challenges. The future for the sodium-ion battery cell technology in the electrification sector of electromobility looks promising and is closely linked to the topics of energy storage and charging infrastructure.

PRESS RELEASE

Please visit www.bmz-group.com for more information about the BMZ Group's range of products.

ABOUT THE BMZ GROUP

The BMZ Group is a global player in the development and production of cross-industry lithium-ion system solutions. The company offers the entire value chain from cell to battery and second life to disposal. In addition to supplying the medical, power, and garden tools markets as well as industrial applications, the BMZ Group prides itself as THE GREEN ENERGY SYSTEM PROVIDER. With the manufacture of home and industrial storage systems for photovoltaic systems as well as batteries for electromobility, BMZ is producing the essential infrastructure required for the energy and transport revolution. With a view to climate change and its consequences, this is how the BMZ Group meets its social, economic, and ecological responsibilities. The company's headquarters are located in Germany, with additional production facilities in China, Poland, the USA, North Macedonia and Brazil as well as branches in Japan, Hong Kong, the UK, and France. Additional R&D facilities are located across the globe. The BMZ Group employs more than 2,500 staff.

PRESS CONTACT:

BMZ Germany GmbH
Christiane Landgraf
Marketing Consultant & PR Officer
Zeche Gustav 1
63791 Karlstein am Main
Germany
Phone: +49 6188-9956-7774
E-mail: christiane.landgraf@bmz-group.com
Website: www.bmz-group.com