PRESS RELEASE

When seconds matter: Protecting AI data centers with nickel-zinc batteries

Supported by Fraunhofer IZM, the startup Zn2H2 has created an innovative and cost-effective way to produce nickel-zinc batteries. This type of battery is particularly suitable wherever large amounts of power are needed within a very short time. And they are the perfect choice for one specific market: AI data centers.

As artificial intelligence has become commonplace, the world needs more and larger data centers. But whenever a new data center is planned, attention has to be paid to what happens when a blackout strikes. In that critical moment between when power from the grid is lost and the emergency generators ramp up, UPS systems - uninterruptible power supplies - jump into the breach and keep things running. However, when the UPS is underpowered or components break, vital services, safeguards, or backup mechanisms may fail and important data could be lost.

UPS depend on batteries to work - on batteries designed to provide all of the power needed for that critical moment until more regular emergency supplies take over. Current systems often use lithium-ion batteries, but they are not a perfect match for the job: They are heavy and expensive and can be a fire hazard.

The startup Zn2H2 Inc., in collaboration with the Fraunhofer Institute for Reliability and Microintegration IZM, aims to develop a new generation of nickel-zinc (NiZn) batteries as an alternative to lithium batteries that are smaller, lighter, safer, and more affordable.

Pooling the know-how of researchers and startup entrepreneurs

The basic mechanism behind NiZn batteries has been known for more than a century, but the technology has struggled with breaking through in the market because the batteries used to be complicated to produce and could not keep up with the number of charging cycles of other types.

Fraunhofer IZM has more than two decades of experience with zinc batteries, making it no surprise that the startup Zn2H2 is located at Start-A-Factory, the R&D incubator lab of Fraunhofer IZM. Start-a-Factory gives the startup team a direct through-line to the wealth of experience at the Institute when working on their vision of a zinc hydrogen battery. Zn2H2 also managed to develop a cost-effective direct coating process for nickel hydroxide ($Ni(OH)_2$) electrodes. This makes it possible to produce extremely high-powered nickel zinc batteries.

Editorial contact
Susann Thoma I Telefon +49 30 46403-745 I Susann.thoma@izm.fraunhofer.de I
Fraunhofer Institute for Reliability and Microintegration IZM I Gustav-Meyer-Allee 25 I 13355 Berlin I www.izm.fraunhofer.de I

Typical batteries of this type are made with a thick sintered layer of nickel hydroxide on the positive side to go with the zinc electrode. The novel process created by Zn2H2 works by depositing nickel directly onto a thin steel foil at the positive electrode. This allows for the production of large-area electrodes that can be coiled, similar to cylindrical lithium-ion batteries. Coupled with the aqueous electrolyte's very high conductivity, the battery can be discharged faster, but also charged again more reliably.

Testing the batteries at Fraunhofer IZM

Putting the Fraunhofer IZM researchers' years of experience with zinc-based batteries and the Institute's established testing infrastructure to good use, the electrodes and NiZn batteries were checked inside out on behalf of Zn2H2 in the Institute's labs. A test run at Fraunhofer IZM for more than 20,000 cycles showed a high discharge rate at over several 100 C and power topping 10,000 W/kg.

For everybody involved in the project, the NiZn batteries' advantages were obvious: With discharge times ranging from a few tens of seconds to around five minutes, the novel NiZn batteries are a great fit for use in hyperscale data centers - or anywhere else where a lot of power is needed for a very limited period of time. They offer energy densities of 40 to 50 Wh/kg at high power and up to 170 Wh/kg at low power. Compared to the standard lithium batteries, a lower overall weight, lower production costs, and more easily sourced raw materials come into play. The batteries would therefore also be suitable for use in combustion engine vehicles to power the starter motors at low temperatures.

The cooperation between Zn2H2 and the Fraunhofer IZM again showed the benefits of such a partnership: Fresh thinking meets years of experience - the perfect seedbed for faster innovation and a quicker time to market.

About Zn2H2

Znh2H2 Inc. focuses on innovative solutions for storing green energy. Its zinc-hydrogen battery, for which a patent has been filed, can be used not only for long-term energy storage but also for hydrogen production. The startup has been a resident at Start-a-Factory (SaF) since 2022 and works very closely with Dr. Robert Hahn and his team. For more information, visit: https://zn2h2.com/.

Technical contact
Dr. Robert Hahn I Telefon +49 30 46403-611 I robert.hahn@izm.fraunhofer.de I
Fraunhofer Institute for Reliability and Microintegration IZM I Gustav-Meyer-Allee 25 I 13355 Berlin I www.izm.fraunhofer.de I

With discharges possible from within some tens of seconds to around five minutes, NiZn batteries are particularly great for use in hyperscale data centers or as starter batteries for combustion engines. © Fraunhofer IZM/Volker Mai | print-quality image: www.izm.fraunhofer.de/pics

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Fraunhofer Institute for Reliability and Microintegration IZM I Gustav-Meyer-Allee 25 I 13355 Berlin I www.izm.fraunhofer.de I

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