April Newsletter 2025

AUSTRALIAN BATTERY SOCIETY

ABS Joins Science and Technology Australia !

The Australian Battery Society (ABS) is thrilled to join **Science and Technology Australia (STA)**, the nation's peak body representing over 225,000 scientists and technologists. As a member, ABS will advocate for advancements in battery science and technology, fostering innovation and collaboration to power a sustainable future. This partnership strengthens our voice in shaping public policy and promoting cutting-edge research across Australia.

New South Wales Introduces Nation-First Product Lifecycle Responsibility Act for Battery Stewardship

New South Wales is leading the charge with its groundbreaking **Product Lifecycle Responsibility Act**, set to make waves in battery stewardship. This nation-first initiative, introduced in March 2025, pushes suppliers to take accountability for the design, recycling, and safe disposal of batteries—especially lithium-ion ones powering our e-bikes, scooters, and homes. With Fire and Rescue NSW reporting 384 battery-related incidents last year alone, the program aims to curb fire risks and environmental harm. By mandating stewardship schemes, it encourages a circular economy, ensuring batteries are reused or recycled responsibly. It's a practical move that balances our tech-driven lives with safety and sustainability. For households and businesses, it's a chance to embrace cleaner energy with confidence. As the program unfolds, it's worth watching how it shapes safer, greener practices across the state!

In this newsletter you will find:

- ABS joining Science and Technology Australia
- NSW Battery Stewardship Programme
- Interview with Alpha HPA
- Australian Industry and Utility Space Update
- Opprtunities
- Sponsors

Australian Aluminium Industry Helping to Make Safer Batteries for Electric Vehicles.

Interview with Nikhil Aravindakshan and Matt Miller from Alpha HPA

The safety of lithium-ion batteries has been of concern at an industrial scale. In this issue of the ABS newsletter, **Dr Binayak Roy** from the Australian Battery Society meets with **Dr Nikhil Aravindakshan** (Product Development Engineer), and **Matthew Millar** (Process Support Engineer) from **Alpha HPA** to discuss how high purity alumina coatings are improving the performance and safety of Lithium-ion (Li-ion) batteries for EVs.

***Binayak**: Could you provide an overview of Alpha HPA's current initiatives and advancements within the battery sector?*

Dr Nikhil: Alpha HPA has developed a process to apply high-purity alumina coatings to various battery components, including anodes, cathodes, cell casings, and other critical parts. Our recent flame tests have confirmed that aluminium Li-ion cell casings, treated with what we've coined as our UltraCoat process, can withstand thermal runaway conditions exceeding 1000 ℃ for over nine minutes, compared to less than 15 seconds for uncoated aluminium casings. Additionally, the alumina coating on anode and cathode materials enhances battery cycling performance while significantly reducingthe risk of fire. Impressive advancements in EV technology are driving the world towards a lower-carbon future, aligning with Alpha HPA's commitment to supporting sustainable and secure energy. We are proud to be making major inroads into improving battery safety with proprietary technology that keeps people and property safer.

Binayak: *What inspired your interest in the battery industry?*

Dr Nikhil: Over the past year, Li-Ion batteries have been linked to nearly 1,000 reported house fires. Through our research, we discovered that the aluminacoating derived from our high-purity aluminium nitrate possesses the necessary purity to enhanceboth the fire safety and cycling performance of Li-ion batteries. However, the commercialisation of this technology has been previously constrained by the limited availability of high-purity aluminium nitrate. Given our capability to produce this critical materialat scale, we saw an opportunity to contribute meaningfully to the field. As a result, we committed ourselves to addressing battery safety challenges through our innovative technology.

Binayak: *What impact does Alpha's expansion have on regional Queensland?*

Dr Nikhil: Our primary focus is now on the development of the Stage Two HPA First Project in Gladstone, Queensland. This state-of-the-art, 10-hectare site will build upon the foundation established by our Stage One operation, utilising Alpha HPA's proprietary, Australian-owned and developed process technology.
Once fully operational in 2027, the facility will have the capacity to produce 10,000 tonnes of high-purity aluminium products annually. In addition to supporting 300 jobs during the construction phase, the project will create 120 permanent local employment opportunities, further contributing to the region's economic growth.

Binayak: *What role does Alpha's technology play in improving battery safety?*

Dr. Nikhil: Alpha HPA's technology plays an integral role in enhancing battery safety and performance through the innovative use of high-purity alumina (HPA) coatings. These specialised

coatings are utilised on key battery components, including cathodes,anodes, and cell casings, significantly enhancing fire resistance and overall durability. By reducing fire risks and optimising battery cycling efficiency, the alumina coatings ensure lithium-ion batteries are not only safer but also more reliable for use in electric vehicles.

Binayak: *How does Alpha's aluminium nitrate coating enhancehigh-nickel cathodes?*

Dr Nikhil: Our Aluminium Nitrate coating plays a crucial role in enhancing high-nickel cathodes by addressing key challenges such as instability and degradation. High-Nickel cathode active materials (CAMs) are known for their potential to increase energy density in lithium-ion batteries, but they often face issues like structural instability, phase transitions and microcracking during charge-discharge cycles.

The Aluminium Nitrate coating acts as a precursor to form an Aluminium oxide (Al_2O_3) or boehmite (AlOOH) layer on the surface of cathode particles. This protective layer mitigates side reactions with electrolytes, particularly hydrofluoric acid (HF), which can degrade high-nickel CAMs. By passivating HF and stabilising the cathode's crystal structure, the coating improves cycle life, reduces capacity fade, provides better thermal stability, and ensures the cathodes maintain their integrity over an extended period.

Binayak: *With fire safety being a major concern for lithium-ion batteries, how do you think Alpha's UltraCoat process contributes to reducing thermal risks?*

Dr. Nikhil: Alpha HPA's UltraCoat process plays a critical role in mitigating thermal risks associated with lithium-ion batteries. By applying high-purity alumina coatings to Aluminium Li-ion cell casings, the UltraCoat treatment dramatically enhances fire resistance. These casings can endure thermal runaway conditions exceeding 1000℃ for over nine minutes – an exceptional improvement compared to uncoated aluminium casings, which withstand similar conditions for less than 15 seconds. This advancement reduces the likelihood of battery fire and contributes to safer, more reliable battery systems for electric vehicles.

Binayak: *What are the key challenges and breakthroughs in scaling up Alpha's production?*

Matthew: Producing an ultra-pure product means separating impurities from that product. Ensuring those impurities are produced not as a waste, but as a saleable and sustainable fertiliser byproduct was a key focus of early process development. After this process breakthrough was achieved, production scale-up was unlocked, removing the process constraints to producing high-volume Alpha HPA products.

Binayak: *As Alpha moves toward full-scale manufacturing, what obstacles have arisen in maintaining material quality and production efficiency?*

Matthew: The move from pilot plant campaigns to continuous PPF scale production highlighted the need for an onsite laboratory to provide sampling results within a couple of hours. With this, the pace of the commissioning increased rapidly, as the process was able to be dialled in and produce consistent 4N+ product within weeks.

Binayak: *Are there emerging applications, such as solid-state batteries or electronics, where these materials are also proving valuable?*

Matthew: Direct Lithium Extraction (DLE) is an emerging and interesting application of our high-purity amorphous aluminium hydroxide product. Amorphous aluminium hydroxide shows superior performance in lithium extraction applications, particularly when compared to crystalline forms of aluminium hydroxide. This space gives Alpha HPA products the opportunity to access the top of the lithium supply chain.

Binayak: *How does Alpha's proprietary aluminium purification process compare to conventional methods?*

Matthew: The existing conventional method is the alkoxide process, which uses aluminium metal as its feedstock. Alpha HPA instead uses an aluminium-based industrial chemical feedstock, which has not undergone the energy-intensive conversion into aluminium metal. From there, the process utilises a proprietary solvent extraction process to separate aluminium from impurities, and in doing so, create a fertiliser byproduct. Solvent extraction is used around the world for the extraction and purification of various metals. This is the first time I'm aware of solvent extraction technology being applied to the purification of commercial quantities of aluminium.

Binayak: *What role does Alpha's high-purity aluminium play in strengthening the battery supply chain and reducing reliance on imports from overseas?*

Matthew: Alpha HPA strengthens the battery supply chain by being a local producer of vital battery materials. With a local feedstock and local partnerships with companies such as Orica, it is poised to kick off a new sector of Australian manufacturing. Australia has all the natural resources to support a domestic battery manufacturing industry, and it's great to see support from the government and public to get the ball rolling.

Matt Millar is a chemical Engineer with 10 years' experience in hydro metallurgical process development, specialising in high-purity products.

Dr. Nikhil Aravindakshan is a Chemical and Materials Science Engineer with over eight years of experience, specialising in the development of advanced nanomaterials.

Australian Industry and Utility Space Update

By Dipan Kundu

Australia on the Verge of a Big Battery Boom

A new report from Bloomberg New Energy Finance (BNEF) predicts that Australia is on the cusp of a significant battery boom, potentially delivering 18 gigawatts (GW) of installed energy storage capacity by 2035. This represents an eight-fold increase from the 2.3 GW installed at the end of 2024. The report attributes this growth to electricity market volatility, supportive government policies, and the expected closure of coal plants, which are driving the shift towards renewable energy

The federal government has been proactive in boosting investment in renewable energy and storage through the Capacity Investment Scheme (CIS). This initiative aims to procure 32GW of firmed renewable capacity, including storage, for the Australian Energy Market Operator's (AEMO's) two wholesale electricity markets. The scheme provides financial security to developers, supporting projects if net revenue falls below an agreed floor or above an agreed ceiling

Millions Invested in Large-Scale Battery Storage

Investment in large-scale battery storage is on the rise, with hundreds of millions of dollars committed to dozens of projects aimed at capturing renewable energy for use during off-peak periods. Among these projects is Pacific Green's Limestone Coast North Energy Park in South Australia, which will have a capacity of 1,500MWh when completed. This facility is expected to store up to 60 percent of South Australia's residential solar output The construction of the larger four-stage Portland Energy Park in Victoria is set to begin in early 2026, with several other projects in the early stages of development. The pipeline of battery projects has strengthened as the cost of the technology decreases, ultimately benefiting consumers through lower market volatility and retail prices

Opportunities

Electrify your battery research in the USA with a grant from the CSIRO Australia-US Researcher Exchange Network

Australia's national science agency, CSIRO, is offering Australian researchers the opportunity to advance the future of battery technology through research grants of up to $30,000. These grants will fund 1-3 month exchanges to the USA, fostering collaboration and knowledge sharing with leading US institutions.

The Australia-US Researcher Exchange Network aims to strengthen Australia-US research ties, build Australian research capacity in battery technology, and ultimately contribute to the development of a robust and sovereign Australian battery industry.

This is your chance to deepen your expertise, boost your career and make a real impact on the future of energy storage.

Act now to:

- advance your battery research & development
- access cutting-edge facilities
- develop commercialisation opportunities for Australian battery technology
- grow your battery manufacturing skills
- expand your North American network.

For more information or to apply, visit www.csiro.au/battery-research-grants
BatteriesR&DGrant@csiro.au

Do you have an opportunity to share?

If you have open positions, PhD, Masters, Post-docs, Technicians, Engineers, etc… in the battery space, please let us know (admin@australianbatterysociety.org), we would love to include here.

Did we miss anything? If so, please drop us a line at admin@australianbatterysociety.org

With that, best wishes to all our subscribers and all involved in batteries in Australia,
Dr. Dipan Kundu, and **Dr. Binayak Roy** on behalf of **The Australian Battery Society**

Our Sponsors

A big thank you to our foundational sponsors

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Particle size, shape, and zeta potential of electrode materials

ACCESS THE APPLICATION REPORT

https://loom.ly/ECIfm10

Introducing the Litesizer Series: Three techniques cover it all!

With the recent launch of our laser diffraction device - Litesizer DIF 500, Anton Paar now offers three different techniques to cover shape and size analysis of particles from the 0.3nm up to 16mm.

Choose the right particle size analyzer based on your needs, all from one manufacturer:

- Litesizer **DIF 500**: Laser Diffraction particle sizer to analyze particles in liquid or dry dispersions.
- Litesizer **DIA**: Dynamic Image Analysis to measure particle size and shape for millions of particles in just a few seconds – dispersion modules interchangable with Litesizer DIF!
- Litesizer **DLS**: Analyze zeta potential of liquid dispersions down to the nanometer range.

Size, shape and stability – one easy interface

Laser diffraction (DIF) is a valuable technique to determine key parameters such as median size, span, and fine fraction content in electrode materials. These parameters are crucial for guaranteeing sufficient fracture resistance.

Dynamic image analysis (DIA) provides significant insights into particle size and shape. For spherical particles, both techniques yield comparable results.

Lastly, zeta potential (ELS/DLS) measurements are becoming essential to ensure homogenous mixtures of electrode slurries and for uniform coatings.

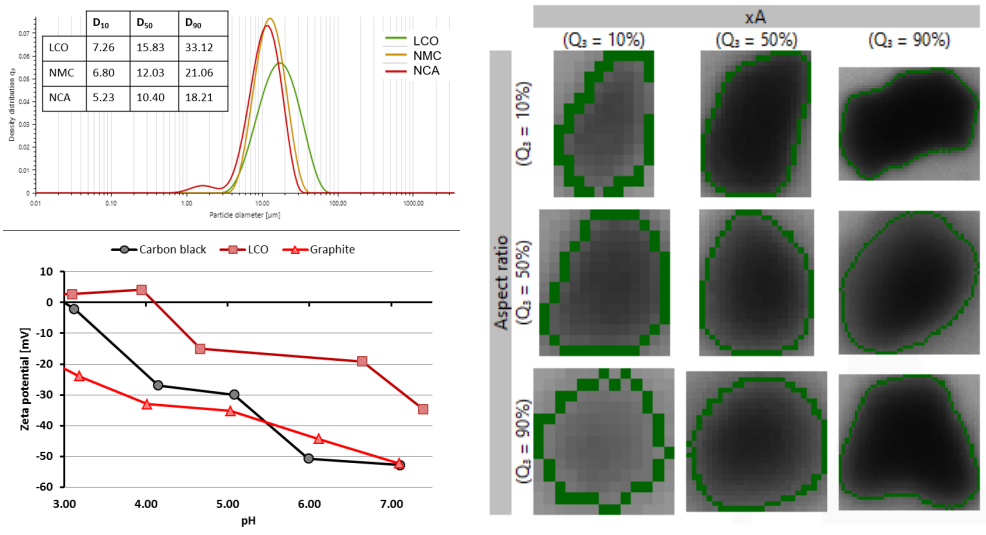

Figure 1. (Top) Particle size distribution of different cathode materials in µm using Laser Diffraction (DIF). (Bottom) pH dependence of zeta potential for carbon black, graphite, and LCO using Electrostatic Light Scattering (ELS). (Right) 3x3 matrix of LCO particles measuring using Dynamic Image Analysis (DIA). All analysis and measurements done via Kalliope Software.

Trade up: From FIRST to BEST!

Trade in any particle sizer (old or new), and get the following package:

- ✓ **Litesizer DIF 500** Laser Diffraction Instrument & Kalliope Software
- ✓ **3** Year Warranty
- ✓ **2** x Maintenance Visits
- ✓ **1** x Free Dispersion Unit (Wet or Dry)

Intellectual Property in Battery Technologies

What is IP?

Intellectual Property (IP) is a product or creation of the mind and a valuable business tool when captured in asset form. In batteries, IP is everywhere. It is in battery design and functionality, both technical and aesthetic features, in trade secrets and know-how that provides a competitive advantage, in the branding that conveys credibility and quality to customers, and the documents and websites that customers use.

The most common forms of IP related to batteries are:

- **Patents**, which protect the functionality of a cell, module or pack including its component parts, device control systems, packaging, fabrication and formation processes and manufacturing, novel device charging and discharging processes, novel applications, critical mineral and component recovery, and recycling methods;
- **Trade marks**, which protect the brand, such as name or logo, of a business, product or service;
- **Industrial designs**, which protect the visual appearance of a product, including a product's look and feel; and
- **Copyright**, which protects the expression of information or content, such as manuals or product information.

There are also other valuable forms of IP relevant to the battery sector, including trade secrets, know-how, and confidential information.

Why should you care about IP?

IP is a business tool used for:

- **Attracting investors** – Investors want assurance you are protecting your IP so that their investment is protected and returns are stronger.
- **Adding assets to the balance sheet** – Particularly for early-stage companies, the value of IP assets can significantly increase the value of a business, and often are the main source of balance sheet value in a presales business.
- **Marketing** – Tell others that you value your brand/products/technology by protecting it and creating a niche or strong foothold in a market.
- **Building a moat** – Deter competitors from copying your IP by establishing a defendable and deterrent position that keeps you ahead in the race for future innovation.
- **Revenue through licensing** – License to other parties such as manufacturers and distributors to use your IP in return for revenue.

And, if the need for enforcement arises, negotiations with other parties can be strengthened with well protected IP assets and can lead to more favourable licensing agreements, such as higher royalty and milestone payments.

Getting help with your IP

While the concept of IP can be simple, protecting the right IP can be quite complex as there is no "one size fits all" approach. For maximum value, your IP strategy needs to be aligned to your business strategy. Also, often the earliest actions taken to protect IP are the most important ones; it therefore pays to get it right from the start by speaking to a professional IP attorney.

Phillips Ormonde Fitzpatrick is one of Australia's oldest independent specialist IP firms, having provided Australians and their businesses with IP support for over 130 years. We are more than just attorneys and lawyers – we are scientists, engineers and technical specialists. Our people have a personable client focus, where we place great emphasis on developing relationships and providing tailored IP solutions across a broad range of technologies. We are the trusted providers of IP services for many notable Australian organisations, including Australia's leading research organisation and several major universities.

Call us on (03) 9614 9144 or get in touch with us via email at info@pof.com.au to discuss how we can help you.

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Market-leading particle size analyser (10nm to 3.5mm) for wet and dry samples. Built-in expertise (SOP Architect/Size Sure) informs critical decision making throughout R&D and manufacturing processes.

SCAN ME

Battery manufacturing: Reliable, adaptable particle sizing

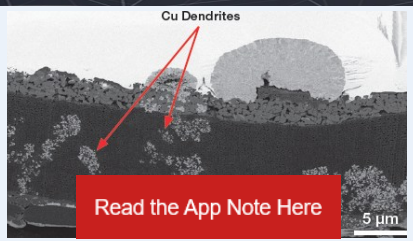
Ensuring that particles used in battery materials are correctly sized is essential for problem-free manufacturing and optimised battery performance. The new Mastersizer 3000+ with SOP Architect, Data Quality Guidance and Size Sure allows anyone to create perfect methods and analyse samples quickly with confidence.

Accelerate battery cathode material QC with automated SEM imaging and analysis

Thermo Scientific™ Phenom™ ParticleMetric Software, offers SEM automation to assess NCM (nickel cobalt manganese oxide) cathodes and its precursors to accelerate QC and manufacturing processes.

Automated impurity analysis for lithium-ion batteries with Perception Software

Thermo Scientific™ Perception™ Software automates analysis of impurity particles during lithium-ion battery manufacturing to enhance quality control processes and ensure the safety and reliability of lithium-ion batteries.



PHENOM XL G2 DESKTOP SEM

High Resolution Imaging & Elemental Mapping

Desktop Scanning Electron Microscope (SEM) with fast, easy-to-use interface. Ideal for large samples up to 100mm x 100mm. Live element ID using integrated X-Ray (EDS) detector.

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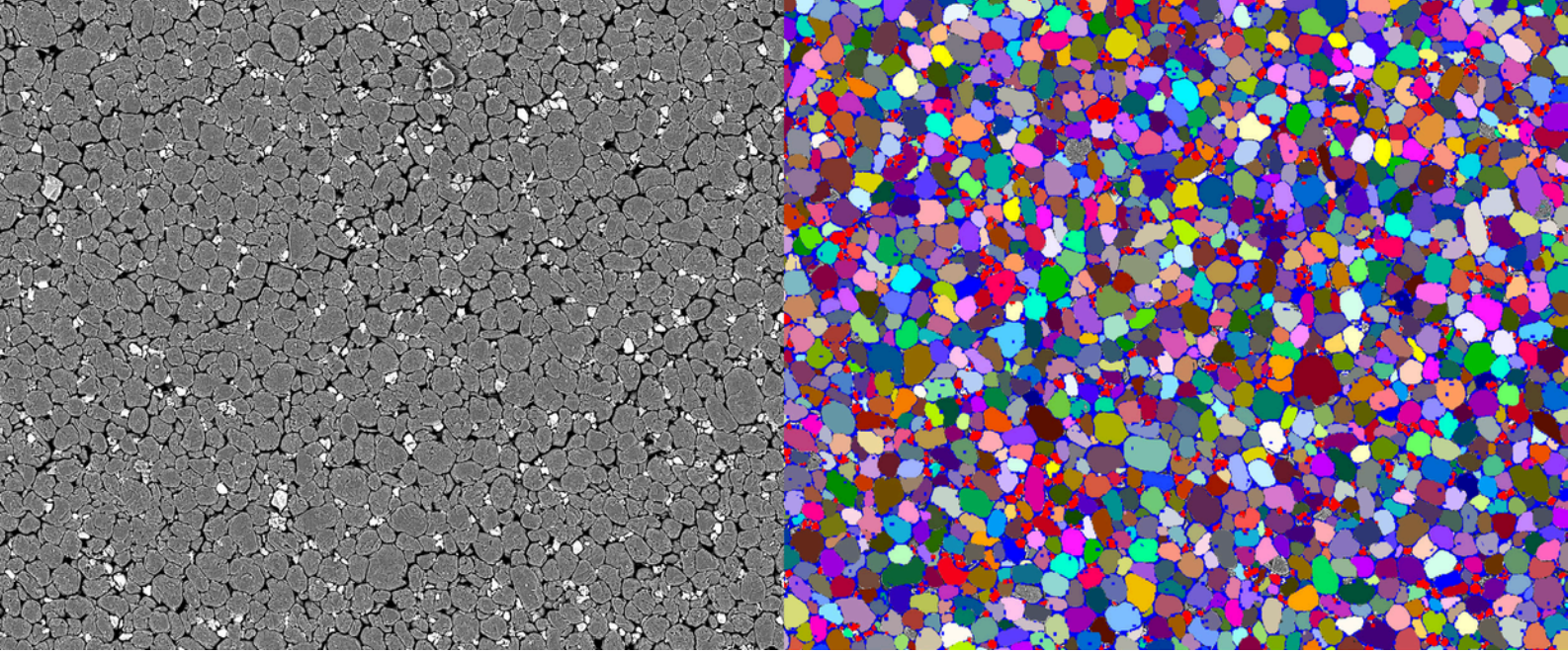

Accurate Particle Size Measurement with ZEISS ZEN core

Accurate particle size measurement is crucial in battery materials characterization for R&D, manufacturing, and quality control. This study explores AI-based methods with ZEISS ZEN core software for analyzing particle size distributions and geometric features using light optical and scanning electron microscopy (SEM). It addresses segmentation challenges by comparing global thresholding, machine learning, and deep-neural-network techniques in lithium-ion battery anodes.

Click here or scan QR code to learn more!

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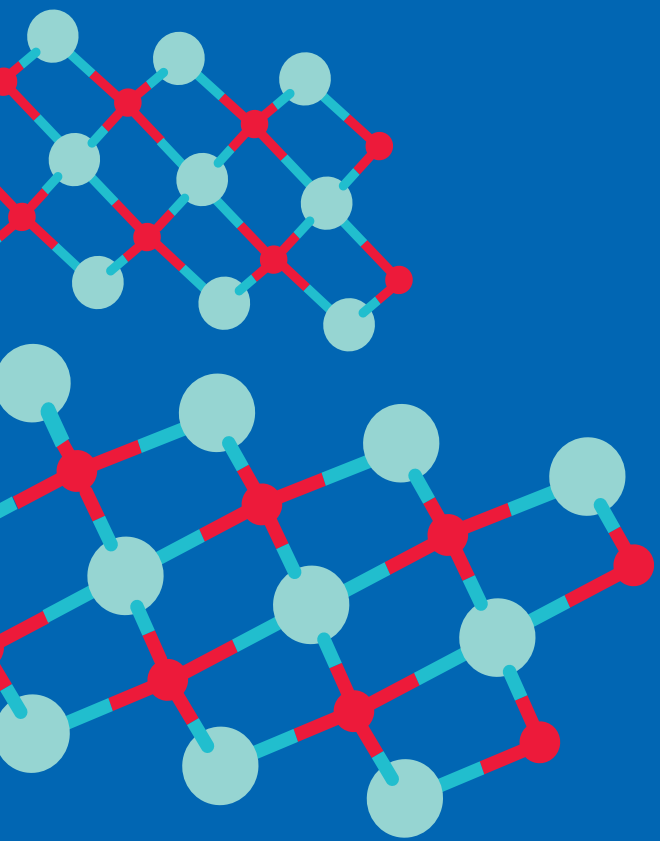

For a complete list of MAX/MXene materials, visit:

SigmaAldrich.com/mxene

THT

THERMAL HAZARD TECHNOLOGY

IBCx® Isothermal Battery Calorimeter

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