



Australian Battery Society Newsletter – June 2024

As batteries, particularly lithium-ion batteries, become more prevalent in society, various organisations are impacted by their use, transport, and disposal. A part of this was highlighted in the ABC's 7.30 report where Dr. Adam Best was called in to discuss the disposal and recycling of lithium-ion batteries following [this article](#) - [Lithium-ion batteries are causing more than 10,000 fires a year in Australia. Waste chiefs say an 'urgent' management plan is needed - ABC News](#).

The transport of lithium-ion batteries is another sector that is working to stay abreast of the technology and ensure safe transport. **The International Air Transport Authority (IATA) asked our own Prof. Neeraj Sharma to present an introduction to lithium-ion batteries**, the types and their hazards, and some insight into future battery technology and how this may impact transport considerations at the 2024 International Forwarders and Customs Brokers Association of Australia National Conference in Cairns in late May. This conference attracts a range of corporate entities and personnel engaged in freight. Disseminating information about lithium-ion batteries and their transport considerations are critical in order to ensure the workforce is able to safely handle, store, and transport batteries. The more we can discuss and disseminate the knowledge about batteries, the more we can ensure their safe transport and use.

Please keep engaging the community about batteries, the impact they are having on society, and how to use, store, and transport them safely.

Scholarship Opportunity to Participate in the Battery MBA Program

The Australian Battery Society is proud to announce another exciting opportunity for one of our subscribers. Battery Associates, which runs the BatteryMBA program ([BatteryMBA - accredited battery online training](#)) has kindly offered a scholarship to one of our female subscribers to participate in this program starting in August 2024.

Are you interested in undertaking the BatteryMBA program? If so, please register using this special link: <https://refer.battery.mba/ugipw>

Make sure to put "Australian Battery Society" in your application referral code section.

What has the industry in Australia been up to?

Clelia's corner 

[WA's first electric bus hits the road](#)

The first electric bus manufactured as part of a joint \$250M initiative between the Australian Government and the Government of Western Australia has been completed. The electric bus was built locally at the Volgren facility in Malaga, in Perth's north, and is one of 18 electric buses expected to be operating on CBD routes by 2025.

Pacific Blue Australia begins construction of new big battery

Construction of a 60 MW, 130 MWh grid-scale battery has begun at Clements Gap, in South Australia. The state already has four operating big batteries – at Hornsdale, Lake Bonney, Dalrymple North and Torrens Island, and hopes to achieve 100% net renewables by 2030.

Incat teams with European companies to build all-electric ferries

Tasmanian ship builder Incat is joining forces with France-based Brittany Ferries and Finland- headquartered Wartsila to explore the design and technical requirements to build a 137 m battery-electric passenger and car ferry. Incat is actively moving towards electric propulsion vessels without compromising speed or efficiency and wants to be part of a net zero carbon emission solution.

What has been happening in the Australian utility space?

Mark's corner 

Community Batteries

Community batteries are changing the electricity landscape in Australia by providing localised energy storage solutions that enhance grid reliability and support the integration of renewable energy sources. These batteries store excess energy generated from local solar panels during the day and release it during peak demand periods, reducing reliance on traditional power plants and lowering energy costs for residents. This localised approach also helps mitigate the issues of grid congestion and transmission losses, making the overall energy system more efficient and resilient. By promoting the use of renewable energy, community batteries play a crucial role in Australia's transition to a sustainable and low-carbon energy future.

The [100 Neighbourhood Batteries Program Grants](#) is a significant initiative by the Victorian Government to support the deployment of community batteries across Victoria. This program aims to fund the installation of up to 100 community batteries in various neighbourhoods, providing grants to local councils, non-profit organisations, and other eligible entities. By fostering the adoption of community batteries, the program seeks to enhance local energy security, reduce electricity bills, and promote the use of renewable energy. New applications open August 2024. For Federal resources, see [Energy](#).

What have Australian researchers been up to?

Dawei's corner 

Recent advances in food waste-derived nanoporous carbon for energy storage

Science and Technology of Advanced Materials

Volume 25, Issue 1, Article Number: 2357062. DOI10.1080/14686996.2024.2357062

The scientists from The University of Newcastle, Prof. Vinu, Ajayan *et al.*, recently reviewed the food waste-derived nanoporous carbon for energy storage. The review paper summarised that nanoporous carbon materials derived from food waste emerge as a promising candidate due to their abundant availability, low cost, and ease of production. Intrinsic factors like the elemental composition of the food sources and extrinsic factors such as pyrolysis and activation conditions shape these properties. Current efforts aim to fine-tune these process parameters to enhance the performance of electrochemical energy storage devices. This review comprehensively examines the latest progress in the fabrication and surface

characterization of porous carbons from different types of food waste, focusing particularly on their application in energy storage technologies, including batteries and supercapacitors.

Enhanced High-Temperature Cycling Stability of Garnet-Based All-Solid-State Lithium Battery Using a Multi-Functional Catholyte Buffer Layer

Nano-Micro Letters

Volume 16, Issue 1, Article Number: 124. DOI10.1007/s40820-024-01358-9

Prof. Zhongping Shao et al. from Curtin University, recently found that using a multi-functional catholyte buffer layer can enhance the high-temperature cycling stability of an all-solid-state lithium battery. In their study, they explored the integration of a multi-functional flame-retardant additive, triphenyl phosphate, into poly(ethylene oxide) to serve as a thin buffer layer between the $\text{LiNi}_0.8\text{Co}_0.1\text{Mn}_0.1\text{O}_2$ (NCM811) cathode and garnet electrolyte. They demonstrated significant enhancements in thermal stability and safety. The results show a capacity retention of 98.5% after 100 cycles at 60°C and 89.6% after 50 cycles at 80°C, with safe and stable cycling up to 100°C. Based on extensive material characterizations, the authors propose a mechanism for the enhanced thermal stability of the interface. These findings underscore the potential of multi-functional flame-retardant additives in overcoming the challenges of electrode-electrolyte interfaces in all-solid-state lithium batteries (ASSLBs) at high temperatures.

Introducing Our Newest Sponsor - ZEISS

The Australian Battery Society is delighted to welcome ZEISS as our sponsor. As we expand, we are honored to witness the industry's enthusiasm in partnering with us. With continued support like this, we can serve our purpose even better. A heartfelt thank you, and we anticipate working together to advance battery research and technology in Australia further. So, Who are ZEISS?

ZEISS is an internationally leading technology company operating in the optics and optoelectronics industries. The company was founded in Jena, Germany, in 1846 and, since 1889, is owned by the Carl Zeiss Foundation (Carl Zeiss Stiftung).

Currently, ZEISS is a one-stop manufacturer of light, electron, ion, and X-ray microscopes, as well as industry-scale computer tomography (CT) and coordinate measuring machines. The correlative portfolio enables characterisation and analysis of battery components across all relevant length scales – from materials and electrodes to complete cells and modules.

These innovative microscopy and metrology technologies have enabled ZEISS to develop collaborative partnerships with battery researchers and manufacturers globally. Building on this experience, ZEISS is looking forward to partner with the Australian Battery Society to support Australia's battery research and industry.

Visit [our website](#) to learn how our research partners use advanced microscopy to reveal the connections between devices, material microstructures, and performance in next-generation batteries and pave the way for new breakthroughs in Energy Materials research.

At ZEISS Australia and New Zealand, we are committed to providing tailored solutions to meet your unique application needs. To discuss how our portfolio can be customised to support you, please contact Dr. Bernd Schulz (bernd.schulz@zeiss.com). Bernd oversees the Materials Science sector at ZEISS Australia and New Zealand, where he leverages over a decade of experience in academic and industrial research.

We look forward to learning more about your specific circumstances and collaborating with you toward success!

News and Events



Hosted by Queensland University of Technology (QUT) in Brisbane, Australia

[QUT - AMSCA-2024](#)



[CAMS2024](#)

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](#), on behalf of The Australian Battery Society

A big thank you to our

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Anton Paar

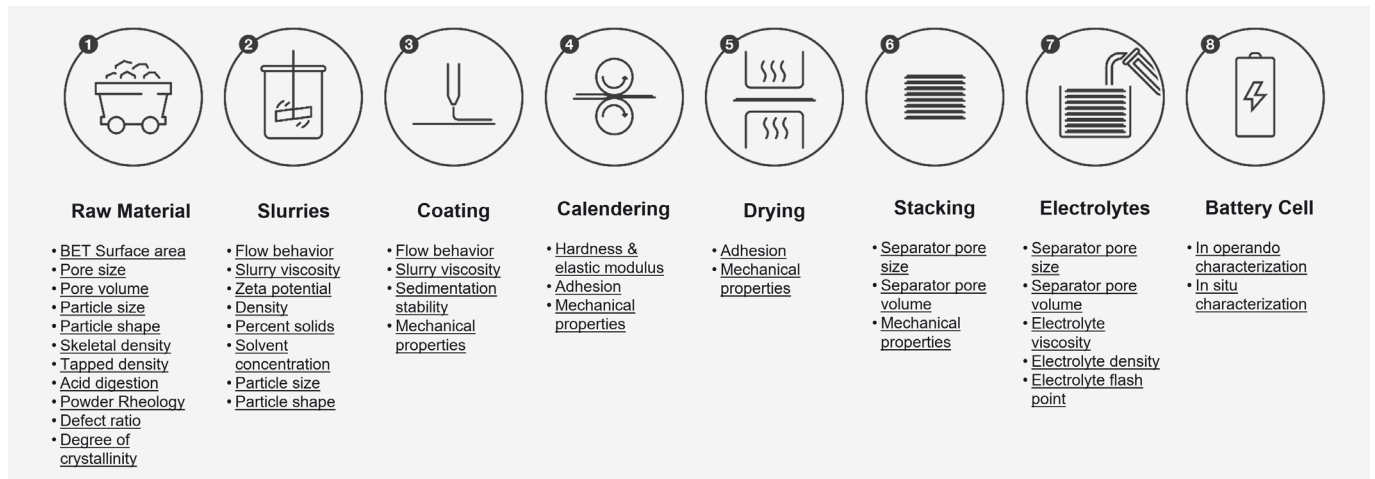
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Advancing Battery Technology with Anton Paar's Comprehensive Analytical Suite



Anton Paar is a leading provider of advanced analytical instrumentation and solutions, catering to the diverse needs of the battery industry. Their comprehensive range of products supports various stages of battery research, development, and production, ensuring high performance, efficiency, and reliability of batteries.

One key area where Anton Paar excels is in the measurement of **electrode surface area**. Accurate surface area measurements are crucial for optimizing the electrochemical performance of battery electrodes.

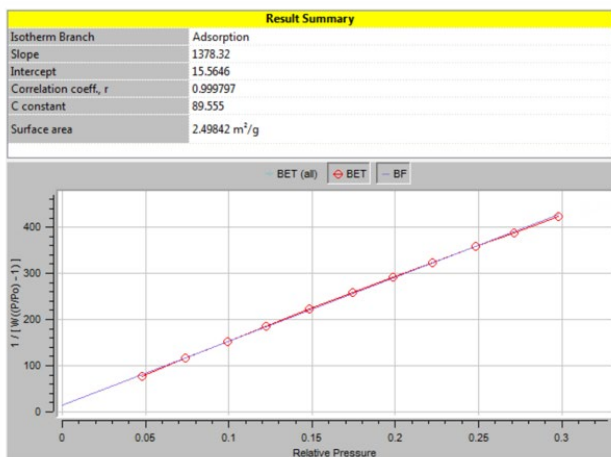


Figure 1. Eleven-point BET plot for graphite using NOVA 600 BET Surface Area Analyser.

Understanding the **crystal structure**, **particle**, and **crystallite size** is essential for the optimization of battery materials. Anton Paar's X-ray diffraction (XRD) instruments and non-ambient chambers deliver

detailed insights into these properties, allowing for the fine-tuning of materials to enhance battery performance.

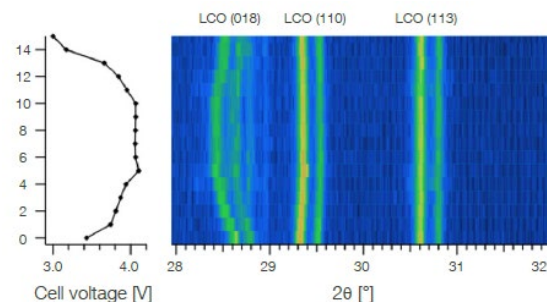


Figure 2. Operando XRD measurement of a pouch cell using XRDynamic 500.

And we are only just scratching the surface! Anton Paar's state-of-the-art instrumentation and expertise can be employed along the battery research and manufacturing process chains, and our commitment to precision and quality makes us an invaluable partner for battery manufacturers and researchers worldwide.

Let's Talk Batteries the Anton Paar Way

Link: <https://www.anton-paar.com/au-en/lithium-ion-battery-production/>

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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 defensible 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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Particle and molecular size using multi-angle dynamic light scattering (MADLS®)

The most advanced light scattering system, delivers enhanced resolution, speed and ease-of-use for the measurement of particle and molecular size, particle charge and calibration-free particle concentration.



MICROMERITICS TRISTAR II

High Throughput Surface Area and Porosity Analyser

An automated, three-station, BET surface area and porosity analyser that delivers excellent repeatability and speed of analysis of battery components to improve storage capacity and energy generation.



MICROMERITICS ACCUPYC

Accurate Density Determination

Besides offering the highest accuracy, repeatability and widest temperature analysis range (4°C to 60°C, ± 0.025 °C), the new touchscreen interface and hinged self-aligning lid provides reliable, frustration-free operation and constant chamber volume. PowderSafe mode and the stored Method Library make it the easiest pycnometer in the world to operate to optimise electrode packing density.



MALVERN MASTERSIZER 3000

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Market-leading laser diffraction particle size analyser (10nm to 3.5mm) to consistently deliver the accurate and reliable data for both wet and dry sample analysis. Intuitive software with built-in expertise informs critical decision-making throughout R&D and manufacturing processes.



PHENOM XL DESKTOP SEM

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supercharge your research & production

Advanced battery materials with extensive
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Whether you're researching new battery materials, realizing prototypes, or already in production, we'll help you achieve it with fresh energy. Our comprehensive range of cutting-edge battery materials offers superior consistency, purity and quality for producing lithium-ion batteries with outstanding performance, durability and dependability. Discover how our unparalleled portfolio can boost your battery breakthroughs.

Your benefits

- **Broad portfolio** of cathode, anode and electrolyte battery materials, greener alternatives, foil materials, binders, electrodes, sheets and more
- **Extensive resources** from expert technical support to insightful literature on the latest battery designs
- **Custom services** including contract manufacturing, QC, documentation and special packaging
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Explore powerful
battery materials

sigmaaldrich.com/battery

The Life Science business of Merck operates as MilliporeSigma in the U.S. and Canada.

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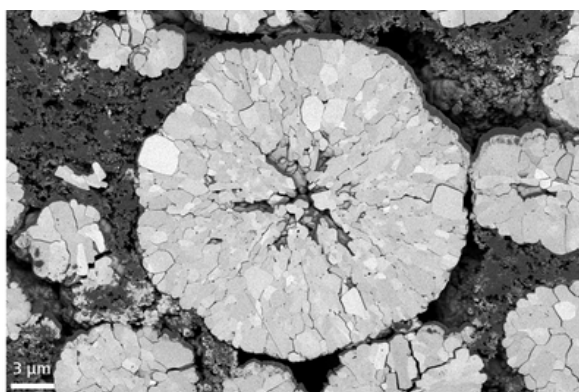


Drive Insight Into Advanced Battery Research

ZEISS Microscopy Solutions for New Frontiers in Battery Research



Materials



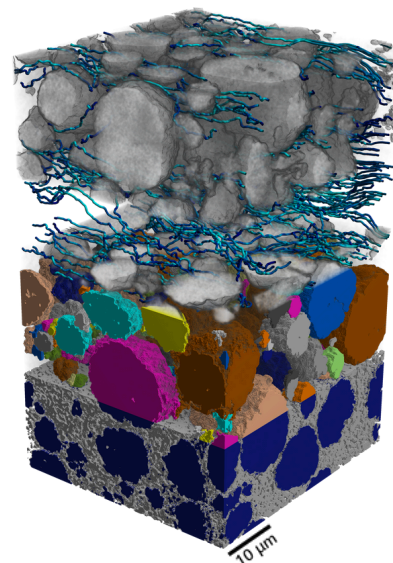
Novel materials will continue to advance battery performance. Whether they store more lithium, demonstrate better cycling stability, utilize more abundant elements, or enable new battery architectures.

Understanding the microstructures of these new materials and the role they play in device performance is critical in accelerating the development cycle. [ZEISS Light Microscopes](#) and [ZEISS Scanning Electron Microscopes \(SEMs\)](#) provide suitable resolution and contrast to characterize microstructures rapidly and successfully.

Electrodes

As batteries are complex functional composites, understanding how the arrangement of materials in electrode microstructures relates to ion movement and cell cycling is important.

[ZEISS Focused Ion Beam SEM \(FIB-SEMs\)](#) instruments or [ZEISS Xradia X-ray microscopes \(XRM\)](#)s provide true and accurate 3D imaging. These imaging allow to reliably measure properties like tortuosity, particle size distributions, and pore connectivity across many different length scales, and provide input to advanced transport and diffusion modeling.



Cells

At the device level, understanding component arrangements and their evolution during cycling is key to understanding battery performance. However, imaging inside intact batteries is challenging due to their closed nature and air-free handling requirements.

[ZEISS XRM](#)s with [Resolution at a Distance \(RaAD\)](#) allows you to uniquely view microstructures inside intact battery cells with industry-leading resolution and contrast. See layers, particle distributions, and other components in their native environment.

[Learn more HERE!](#)

