

CATHODE, SOLID-STATE LITHIUM ELECTROLYTE AND CONDUCTOR DEPOSITED IN A SINGLE DRY STEP

Manufacturing process breakthrough demonstrates a streamlined solid-state battery pathway targeting high density computing, data centers, defence and aerospace applications.

- **Complete composite layer built in one step:** Cathode, solid-state electrolyte (LLZO reference) and a carbon-nanotube matrix co-deposited in a single step, advancing manufacturing potential for solid-state lithium-ion batteries. No solvents, no binders, no drying ovens.
- **'3D printing' Process:** DSD builds the battery layer by "printing" cathode material in a single room-temperature pass, building a dense, uniform layer. Removing solvents, drying lines and furnaces targets some of the most energy and capital intensive steps in battery manufacturing.
- **Embedded carbon-nanotube conductive network:** a high-performance material was co-deposited in the same single step, building conductivity directly into the layer.
- **Why Solid-state:** Increased energy density - more energy for less weight improves performance, improved safety (non-flammable liquid electrolyte), and greater reliability across extreme temperatures — making them better suited to defence, aerospace and high-density computing applications.
- **Form-flexible** potential to '3D Print' batteries to conform to the geometry of a platform's airframe rather than to standard cell formats — technology class relevant to high-endurance aerospace and satellite applications, with potential to reduce mass and thermal-management hardware.
- **Why it matters:** Battery chemistry performance is only valuable if it can be manufactured reliably, safely and cost-effectively. This milestone shows cells can be built by a scalable, solvent-free process — de-risking the licensable IP that underpins the program's value.
- **What comes next:** Coin-cell electrochemical testing is underway to measure the baseline performance with a full-format pouch cell currently being developed for independent evaluation.

Critical Resources Limited ('Critical Resources' or the 'Company', ASX:CRR) is pleased to report progress in its solid-state battery evaluation program: a complete cathode, electrolyte and conductive network layer deposited in a single step — no solvents, no ovens, no furnaces. This delivers the next step flagged in the Company's 5 March 2026 announcement, progressing from a validated solvent-free LFP cathode to a complete composite layer. The work is conducted at the South Dakota School of Mines & Technology within the US National Science Foundation (NSF) supported Centre for Solid-State Electric Power Storage (CEPS) research program.

For Critical Resources, the purpose of the DSD evaluation program is a validated, solvent-free manufacturing process that can be licensed to cell and component makers. Each milestone that de-risks that process widens the licensing and partnership opportunity across the defence, aerospace, industrial and high-density computing markets the Company is targeting.

This follows the Company's recent non-sulphur electrolyte (**ASE**) benchmark results, which confirmed the material conducts lithium ions at 3.2 mS cm^{-1} — among the highest reported for non-sulphide, non-halide amorphous electrolyte chemistries, making it suitable for defence, aerospace and industrial applications where sulphide-based materials are ruled out on safety grounds (ASX:CRR announcement 28 May 2026). The DSD milestone demonstrates that the electrolyte can also be manufactured reliably, using a solvent-free process. **Material performance is only valuable if it can be manufactured reliably. Both workstreams have been advanced in parallel within the CEPS framework precisely to validate this integration.**

In a material advancement for the Company's solid-state battery evaluation program, **solid electrolyte material has been created via DSD — integrating a single composite cathode layer that combines cathode material, solid electrolyte and a carbon-nanotube conductive network.** The entire layer was produced in one dry, room-temperature step, with no solvents, drying cycles or furnace processing, addressing the second half of the solid-state challenge: how such materials can be manufactured.

What the deposited layer actually looks like

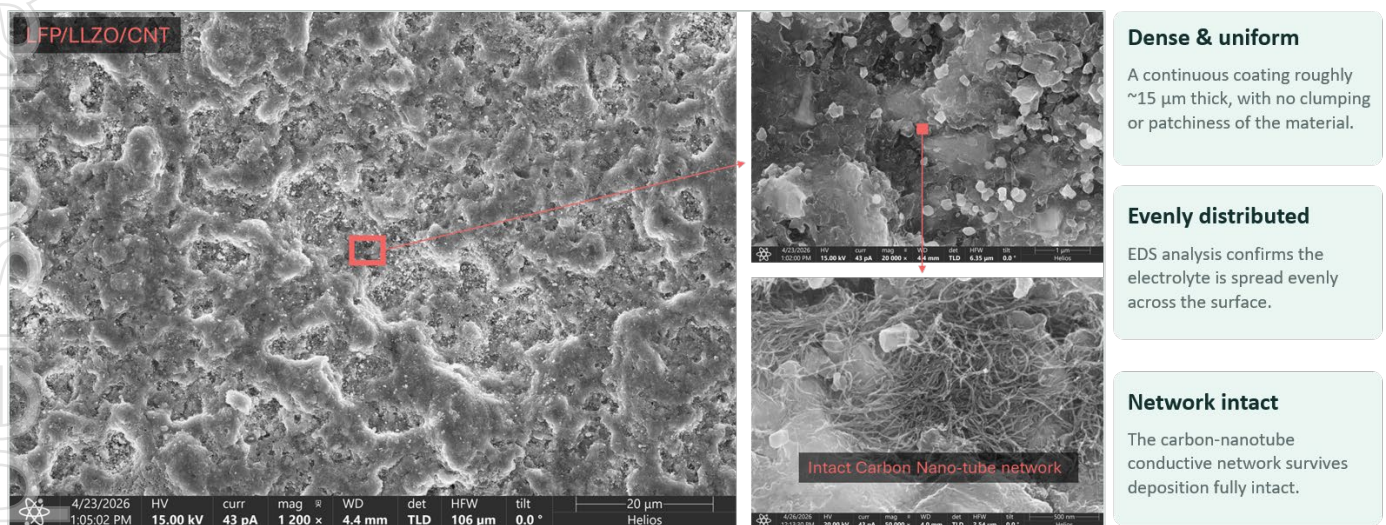


Figure 1 - Surface view of the LFP/LLZO/CNT matrix. Scanning electron microscope (SEM) images of the single-step, solvent-free co-deposited layer. **Left:** wide-field view (20µm) of the composite cathode/electrolyte layer (LFP cathode, LLZO reference electrolyte and carbon-nanotube network), showing a dense, uniform coating. **Top right:** higher-magnification image (1 µm), showing the distribution of cathode and electrolyte particles. **Bottom right:** higher-magnification image (500nm) showing intact carbon-nanotube network after deposition. Each carbon-nanotube is roughly a few thousand times thinner than a human hair, forming a lightweight conductive network.

STRATEGIC CONTEXT

Solid-state battery technology offers fundamental advantages over conventional lithium-ion in high-reliability applications: safety, superior energy density at lower system weight, and improved thermal stability across a broad operating range. Critical Resources' evaluation program is specifically designed to validate manufacturing methodologies that preserve these advantages while remaining compatible with defence,

industrial, and high-density computing environments — settings where conventional lithium-ion batteries face thermal, weight, and reliability constraints.

Critical Resources' model is to develop and license battery and manufacturing-process intellectual property — not to manufacture. The Company holds interests in both lithium resources (Mavis Lake Lithium Project) and next-generation battery technology IP, advancing independently, with each broadening the Company's optionality across future partnerships, licensing and commercial pathways.

Critical Resources holds an exclusive option over a portfolio of solid-state battery patents developed at the South Dakota School of Mines & Technology — five granted US patents and one pending application (refer ASX:CRR announcement 18 November 2025). One of those granted patents (US 10,991,976, a high-temperature solid-state electrolyte (HTE)) was developed with NASA support; as is standard for federally supported inventions, the United States Government retains certain rights in that patent. All new materials, processes and structures developed under the CEPS framework, including the dry-deposition work reported here, are being protected through filed provisional patent applications, reinforcing the Company's licensable IP position (refer ASX:CRR announcement 5 March 2026).

	CONVENTIONAL LITHIUM-ION	SOLID-STATE DESIGN
Energy density	✗ Lower — bulky separators and liquid volumes limit energy per kilogram	✓ Higher potential — more usable energy in less weight and volume
Safety	✗ Flammable liquid electrolyte — carries thermal-runaway and fire risk	✓ No flammable liquid — thermal-runaway pathway substantially reduced
Operating temperature	✗ Narrower window — performance degrades under heat or cold	✓ Wider range — more stable across temperature extremes

These are potential advantages of the solid-state technology class and are not results demonstrated by CRR. Realising them at commercial scale depends on solving the manufacturing challenge — the focus of CRR's solid-state lithium-ion battery evaluation program.

Figure 2 – Benefits of solid-state lithium-ion cell architecture.

The DSD workstream is therefore being validated as a licensable, solvent-free process rather than a production line the Company would build or own. Rather than backing a single route at this early evaluation stage, CRR is validating two parallel solvent-free deposition methodologies — broadening the licensable process-IP position and allowing direct comparison of interface quality, repeatability and scalability across both approaches.

Because DSD deposits active material directly rather than assembling and pressing finished layers, it dispenses with solvents, binders and much of the conventional cell housing — and carries a second advantage beyond simpler manufacturing: **form-factor freedom**. A deposition-based process could, in principle, build cells to the geometry of the host platform rather than to standard cell formats, reducing both mass and the surrounding thermal-management hardware. This is the same principle driving lightweight energy-storage research in aerospace, from high-altitude solar UAVs dependent on overnight endurance to structural-battery work integrating cells into airframes. For a company licensing process IP rather than building cells, a capability like this widens the range of platforms a future licensee could serve.

The thermal tolerance, safety and energy density that suit defence and computing extend this relevance further — to space and satellite platforms, where conventional liquid-electrolyte cells face fundamental constraints that solid-state chemistry addresses at the architecture level.

THE MILESTONE: A COMPLETE COMPOSITE LAYER IN ONE STEP

Building a solid-state battery requires bringing together three things that normally have to be made and joined separately: the cathode (which stores energy), the solid electrolyte (which carries lithium ions), and an electronic conductor (which moves electrons in and out). Achieving strong interface stability between these materials is **one of the hardest problems in the field** — poor contact between them is a leading cause of solid-state cell failure.

Using DSD, CRR's program deposited all three together in a single composite layer. The composite combined lithium iron phosphate (LFP) cathode material, lithium lanthanum zirconium oxide (LLZO) solid electrolyte, and carbon-nanotubes (CNT), accelerated onto a battery-grade aluminium foil substrate. The result was a dense coating approximately 15 microns thick, with EDS analysis confirming the electrolyte was evenly distributed across the surface rather than clumped or patchy (**Figure 1**).

The electrolyte used in this trial was LLZO, a well-characterised reference electrolyte chosen to validate the deposition process. It is distinct from the Company's proprietary Amorphous Solid-State Electrolyte (ASE); depositing the ASE material by DSD is a later development step.

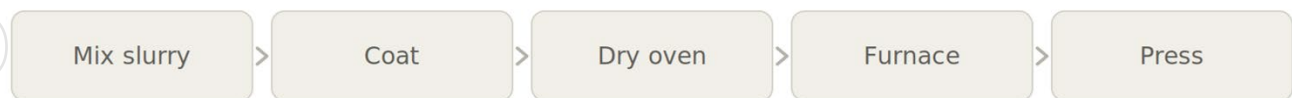
IN PLAIN TERMS

DSD builds the battery layer similar to 3D printing — spraying prepared material onto a surface in one room-temperature pass. It replaces a chain of energy- and capital-intensive stages with a single dry step.

Doing this in a single step tackles two challenges together: the difficult join between the cathode and the electrolyte (press/compression), and the cost, energy and complexity of conventional battery manufacturing. Critical Resources' DSD process tackles both problems at once. Extending it to deposit the electrolyte on its own is the next step toward simpler, lower-cost solid-state battery manufacturing.

From a multi-stage line to a single dry step

CONVENTIONAL MANUFACTURING



DSD replaces the entire line with a single dry pass



DSD PROCESS – ONE STEP

Cathode + electrolyte + conductor in one room-temperature pass — no solvents, ovens or furnaces

WHY THESE RESULTS MATTER

- **Tackles the hardest interface in the cell:** Co-depositing electrolyte and cathode together distributes cathode–electrolyte contact throughout the composite as it is built, rather than trying to press two finished layers together afterwards.
- **Solvent-free and low-temperature:** Removing solvents, drying lines and furnaces reduces the cost, energy use, footprint and complexity of manufacturing — and removes a major weight and thermal burden for batteries deployed in defence, industrial and high-density computing environments.
- **Built around CRR's extreme-environment focus:** The approach is aligned with the Company's focus on batteries that perform where conventional lithium-ion struggles — across wide temperature ranges and demanding duty cycles.
- **Relevant to emerging high-value markets:** The same characteristics that CRR's program is advancing — thermal stability, non-flammable chemistry, high energy density and reliable performance across extreme temperature ranges — are the same requirements increasingly identified for space and satellite applications. The technology addresses these environments not as an adjacent opportunity, but as a direct extension of its core design focus.

CARBON-NANOTUBES: AN ADVANCED CONDUCTIVE NETWORK, BUILT IN

Carbon-nanotubes are among the most studied advanced nanomaterials in energy storage. Each tube is a cylinder of carbon roughly a few thousand times thinner than a human hair, yet exceptionally strong and highly electrically conductive. In a battery electrode they form a continuous, lightweight network that moves electrons efficiently while using far less material than conventional carbon additives.

In CRR's composite, carbon-nanotubes were co-deposited in the same supersonic spray step as the cathode and electrolyte, forming a conductive network distributed through the layer and visible across the coating surface. Embedding this network directly during a single dry deposition step — rather than mixing it into a wet slurry and drying it — reflects the kind of advanced-materials engineering the Company is pursuing to differentiate its technology.

TWO WORKSTREAMS, ONE INTEGRATED STRATEGY

CRR's solid-state battery evaluation program advances two complementary workstreams. The ASE workstream addresses the core materials challenge — how well the electrolyte conducts lithium ions and how stable it is. The DSD workstream addresses the manufacturing challenge — how the electrolyte and cathode can be built into a working cell without solvents or furnaces. The milestone reported here connects the two: it demonstrates that electrolyte material can be incorporated into a manufactured composite layer using a scalable, solvent-free process.

The two workstreams are complementary, not independent: solid-state development requires both an electrolyte that conducts lithium ions efficiently across a wide temperature range and a manufacturing method compatible with solid-state architectures.

ASE program (materials): Addresses the core materials challenge — ionic conductivity and activation energy. Benchmark results establish competitive performance on both primary metrics from a first-pass, unoptimised composition.

Manufacturing program (fabrication): Addresses the manufacturing pathway — solvent-free, low-temperature cathode and electrolyte fabrication. Dual-pathway results establish feasibility of the solvent-free approach and a repeatable manufacturing baseline. Solvent-free, dry fabrication has independently emerged as the preferred manufacturing architecture in advanced aerospace battery programs: **NASA's SABERS program (Solid-state Architecture Batteries for Enhanced Rechargeability and Safety) adopted the same dry-process principle as one of its core manufacturing innovations.**

The same properties CRR's program is validating — high energy density, non-flammable electrolyte, wide temperature range, and the potential to be 'printed' into any form — make solid-state batteries an important requirement for the growth of defence, aerospace and high-density computing applications where conventional lithium-ion cells fall short.

One platform. Four high-value, extreme-environment markets.

The attributes CRR's program is validating address constraints that limit conventional lithium-ion where it is pushed hardest.



Figure 3: Potential target applications of solid-state battery technology. The attributes CRR's program is validating — high energy density, non-flammable electrolyte, wide temperature range, and form-flexible deposition — address the core constraints that limit conventional lithium-ion in each of these environments.

WHERE WE ARE: PROGRAM PROGRESS AT A GLANCE

Program Stage	Workstream	Status
Electrolyte material benchmarked (ionic conductivity, stability).	ASE (electrolyte)	✓ Complete
Single-step composite layer deposited (cathode + electrolyte + conductor, solvent-free).	DSD (manufacturing)	✓ Complete
Coin cell electrochemical baseline (charge/discharge vs. known reference).	DSD (manufacturing)	In progress
Full-format pouch cell prototype.	DSD + benchmark electrolyte	Next
Independent testing of DSD pouch cell prototype.	DSD + benchmark electrolyte	Next
FULL SOLID-STATE CELL: Solid-state ASE and HTE electrolytes integrated with DSD process.	ASE + DSD	Planned

Critical Resources Managing Director, Tim Wither, commented: *'Depositing solid electrolyte, cathode and a carbon-nanotube conductive network in a single step, is a genuine milestone for our program. The hardest part of a solid-state battery is the join between the cathode and the electrolyte, and forming that join during manufacture — rather than pressing finished parts together afterwards — is exactly the kind of problem this technology is designed to solve.'*

'Doing it solvent-free, at room-temperature, and with an advanced carbon-nanotube network built in, points to a cleaner and simpler way of making these cells. Pairing this with our ASE electrolyte results means we are now making progress on both halves of the solid-state battery problem — the material and the manufacturing.'

'This is early-stage laboratory work, not commercial manufacturing. Depositing a standalone electrolyte layer on its own is still in development, and we are working through it methodically. But the direction is very encouraging, and we will keep advancing it through a disciplined, capital-light evaluation approach with outstanding work from the South Dakota School of Mines team.'

NEXT STEPS

Critical Resources will continue advancing the DSD program under the structured evaluation framework with CEPS and SDM. These activities are designed to strengthen the technical foundation of the Company's solid-state battery strategy without implying commercial manufacturing at this stage. Key next steps include:

- **Standalone electrolyte deposition:** Condition electrolyte feedstock (including ball-milling to improve particle sphericity and flow) to progress toward deposition of a discrete, pure-electrolyte layer by DSD.
- **Composite characterisation:** Complete SEM, XRD and XPS analysis of the deposited composite to confirm coating density, phase stability and the distribution of the electrolyte and carbon-nanotube network.
- **Electrochemical baseline testing underway:** Coin cell (CR2032) electrochemical testing of the DSD composite has commenced. A liquid electrolyte is used as a known performance reference — standard practice at this stage — to establish a baseline ahead of solid-state electrolyte integration. Early electrochemical results show charge and discharge behaviour consistent with the cathode / electrolyte materials performing as expected. Full characterisation is ongoing. Results will inform the transition to full-format pouch cell testing.
- **Process optimisation:** refine deposition parameters using the computational model to widen the operating window systematically.

These activities represent defined technical gates within CRR's broader solid-state battery evaluation strategy, designed to systematically de-risk solvent-free manufacturing pathways while maintaining a disciplined, capital-light, laboratory-stage evaluation approach. Outcomes will inform prototype development strategy and downstream partnership, validation or licensing opportunities aligned with defence, industrial, and high-reliability infrastructure markets.

This announcement has been approved for release by the Board of Directors of Critical Resources.

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ABOUT CRITICAL RESOURCES LIMITED

Critical Resources Limited (ASX:CRR) is an Australian mining and technology company focused on the discovery and development of critical metals and next generation technologies essential to a sustainable future. The Company holds a diversified portfolio including the Mavis Lake Lithium Project in Ontario, Canada, the Halls Peak Base Metals Project in New South Wales, and a growing gold portfolio in New Zealand.



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The scientific and technical information in this announcement relating to the solid-state battery program is based on, and fairly represents, information reviewed and approved by Dr Alevtina Smirnova, Director of the US National Science Foundation-supported Centre for Solid-State Electric Power Storage at the South Dakota School of Mines & Technology and Technical Advisor to Critical Resources. The underlying experimental work was conducted by the CEPS research team at the South Dakota School of Mines & Technology. Dr Smirnova has consented to the inclusion of this information in the form and context in which it appears.

FORWARD LOOKING STATEMENTS

This announcement may contain certain forward-looking statements and projections, including statements regarding the Company's solid-state battery technology and intellectual property programs, the expected performance, optimisation and development of its electrolyte and manufacturing workstreams, the potential applications and markets for that technology, and the Company's plans with respect to its mineral properties and programs. Forward-looking statements can generally be identified by words such as 'may', 'expect', 'intend', 'plan', 'target', 'potential', 'anticipate' and similar expressions. Such forward-looking statements/projections are estimates for discussion purposes only and should not be relied upon. They are subject to known and unknown risks, uncertainties and assumptions and may therefore differ materially from results ultimately achieved. The benchmark assessment and laboratory results referred to in this announcement are early-stage and are not indicative of commercial performance. There can be no assurance that ongoing optimisation will achieve improved or commercially viable results, that the Company's battery technology will be successfully developed, scaled or commercialised, or that any intellectual property option held by the Company will be exercised or prove valuable. There can also be no assurance that CRR's plans for development of its mineral properties will proceed as currently expected, that the Company will be able to confirm the presence of additional mineral resources, that any mineralisation will prove to be economic, or that a mine will successfully be developed on any of CRR's mineral properties. Critical Resources Limited does not make any representations and provides no warranties concerning the accuracy of the projections and disclaims any obligation to update or revise any forward-looking statements/projections based on new information, future events or otherwise, except to the extent required by applicable laws. While the information contained in this announcement has been prepared in good faith, neither Critical Resources Limited nor any of its directors, officers, agents, employees or advisors give any representation or warranty, express or implied, as to the fairness, accuracy, completeness or correctness of the information, opinions and conclusions contained in this announcement.