Critical Resources Limited

INDEPENDENT PEER-REVIEWED PUBLICATION CONFIRMS CRR'S DRY CATHODE MANUFACTURING TECHNOLOGY

International peer-reviewed publication confirms DSD dry-deposition process — solvent-free, binder-free, single-step, with coulombic efficiency above 99.5% over 500 cycles (~1,250 hrs)

- **International peer-reviewed validation:** CRR's optioned dry supersonic deposition (DSD) technology has been validated in a peer-reviewed international journal as a solvent and binder-free cathode manufacturing method.
- **Durable published performance**: results are the first set of unoptimised DSD trials in coin cell format on a liquid-electrolyte reference, delivering approximately 154 mAh/g — near LFP's theoretical capacity — and held approximately 85% of its capacity over 500 cycles at 1C (~1,250 hrs), with coulombic efficiency above 99.5%.
- **The benefits of dry manufacturing:** DSD builds the cathode dry, in a single step directly onto the current collector — no toxic solvents, no polymer binders, and no drying ovens — removing the costly, energy and capital-intensive stages of conventional slurry electrode manufacturing.
- **De-risks the licensable IP, capital-light:** Independent peer review of the core process strengthens CRR's position and de-risks the technology, widening the licensing and partnering opportunity.
- **Solid-state electrolyte integration next for All Solid-State Battery (ASSB):** The work is a proof-of-concept on a liquid-electrolyte reference. Integrating CRR's optioned proprietary sulphur-free Amorphous Solid Electrolyte (ASE) with the DSD process is the next stage toward an all-solid-state cell; thin-film ASE deposition and full-format pouch-cell cycling are ongoing.

Critical Resources Limited ('**Critical Resources**' or the '**Company**', ASX:**CRR**) is pleased to report that peer-reviewed research validating the dry supersonic deposition (DSD) cathode technology it holds under exclusive option has been published in the international journal Electrochimica Acta (Rodmyre et al., "Formation mechanism of solvent- and binder-free cathode nanostructures produced by supersonically accelerated lithium iron phosphate ceramic particles", Electrochimica Acta, Vol. 574, 2026, article 149386).

The publication provides independent, peer-reviewed confirmation of the solvent and binder-free manufacturing method at the core of the Company's licensable intellectual property. The DSD process is the subject of a provisional patent application, over which CRR holds an exclusive option. CRR's strategy is to commercialise this technology through licensing rather than by manufacturing cells itself. The underlying work was conducted at the South Dakota School of Mines & Technology (SDM) within the US National Science Foundation (NSF) supported Centre for Solid-State Electric Power Storage (CEPS).

The evaluation program is led at SDM by Dr Alevtina Smirnova, Director of the Centre for Solid-State Electric Power Storage and Technical Advisor to Critical Resources. The Centre operates within the US National Science Foundation (**NSF**) supported research framework. Dr Smirnova's research developed the solid-state battery IP over which the Company holds its exclusive evaluation option (refer ASX:CRR announcements 17 February 2026 and 18 November 2025).

At this stage of its evaluation program, Critical Resources' strategy would be to license its battery materials and manufacturing IP, not to become a manufacturer of cells itself. Each step of the Company's evaluation program that de-risks the DSD process — including building it into a working full-format cell — widens the Company's potential licensing and partnership opportunities.

WHY DRY MANUFACTURING MATTERS

Conventional battery electrodes are made by a wet "slurry" process: the active material is mixed with a polymer binder and a solvent, coated onto a metal foil, then passed through long, high-temperature drying ovens to drive the solvent off. That solvent is typically N-methyl-2-pyrrolidone (NMP) — toxic, costly, and energy-intensive to evaporate and recover — and the **polymer binder (commonly PVDF) is electrically insulating and can block part of the active surface**.

Together, the solvent, the binder and the drying step add significant cost, energy and capital to manufacturing, and carry an environmental burden. DSD removes them entirely: the ceramic cathode material is accelerated to supersonic speed and deposited dry, directly onto the current collector, in a single step — no solvent, no binder, no drying oven.

Conventional cathode manufacturing	CRR's DSD cathode process
Active material dispersed in a solvent-based slurry	Uses dry cathode powder
Requires toxic chemical solvents	Solvent-free process
Requires a polymer binders reducing conductivity	No binder required
Coating dried in ovens, with solvent recovery	No drying or solvent-recovery step
Separate press (calendering) step to compact the coating and raise density	During deposition process material is compacted to high density
Multiple sequential process steps	Fewer process steps
Coating applied to flat sheet substrates	Deposition method suited to 3D printing and form-fitting geometries

During DSD process the cathode material is built from a dry, accelerated particle stream rather than a wet coating, the method is inherently suited to deposition onto three-dimensional and form-fitting geometries, unlike continuous flat-sheet processes.

The published study sets out the formation mechanism of the dry-deposited cathode and its electrochemical performance, and a key finding is the role of a short heat-treatment step. As-deposited, the supersonically

deposited LFP is partially amorphous and underperforms, with lithium-ion diffusion roughly two orders of magnitude lower than the crystalline material. A moderate anneal (around 350°C) restores crystallinity — a transformation the authors show is reversible — and, importantly, the heat-treated cathode recovers the electrochemical performance expected of crystalline LFP, indicating that the dry-deposition process does not permanently degrade the active material.
At low rate (0.1C), the heat-treated cathode delivered approximately 154 mAh/g — close to LFP's theoretical capacity of around 170 mAh/g — confirming that near-full capacity is recovered after dry deposition. T**his early, unoptimised first set of DSD trials, it also held approximately 85% of its capacity over 500 cycles (approximately 1,250 hrs) at 1C, with coulombic efficiency above 99.5%.**

Rate capability at higher currents is lower, as expected for an unoptimised first-pass cathode, and improving high-rate performance forms part of the ongoing optimisation work. Published results used a lithium-metal anode and a standard liquid electrolyte in coin-cell format, with further optimisation of the deposition parameters as future work.

The independent peer review provides credibility and validates the innovative manufacturing process of CRR's solid-state program, strengthening the program's position in discussions with potential cell and component-maker licensees.

The published work uses a liquid electrolyte as a reference; the next stage is to integrate the Company's proprietary sulphur-free ASE solid electrolyte with the DSD process, working toward a full solid-state cell. That integration, together with full-format pouch-cell cycling, is ongoing; both involve extended cycle times, and results will be reported as they are completed and confirmed.

CRR's Amorphous Solid-State Electrolyte (**ASE**) — distinct from the LLZO reference phase used in the DSD composite — has been **benchmarked at 3.2 mS cm^{-1} ionic conductivity and 0.27 eV activation energy**: superionic-class conductivity, competitive with sulphide-class performance, without sulphur, and among the highest reported for the non-sulphide, non-halide amorphous class from a first-pass, unoptimised composition (refer ASX:CRR announcement 28 May 2026) with ongoing work to integrate into the pouch-cell platform, replacing the liquid electrolyte baseline.

CRR's optioned IP portfolio also includes a high-temperature solid-state electrolyte (**HTE**), covered by US Patent 10,991,976 and developed with NASA support (the US Government retains certain rights, as is standard for federally supported inventions). HTE is part of the Company's licensable IP position and does not form part of the current pouch-cell work; its planned role is later integration alongside ASE, as shown in the program table below (refer ASX:CRR announcement 18 November 2025).

> **Critical Resources Managing Director, Tim Wither, commented:** '*An international peer-review is real validation of the work being completed at the South Dakota School of Mines and Technology. Peer review is a high bar, and clearing it helps de-risks the process that sits at the core of our evaluation program — it is exactly the kind of third-party endorsement that matters when you are talking to potential partners to move this technology forward.*
>
> *The benefits of dry, solvent-free manufacturing are well understood in the industry; what this paper does is demonstrate them, with data, for our process. These are proof-of-concept from a first, unoptimised set of trials on a liquid-electrolyte reference, not a finished commercial cell, and the strong numbers belong to the heat-treated cathode. Even so, holding around 85% of capacity over 500 cycles is a genuinely encouraging durability result at this stage, and it shows the dry process does not degrade the material. This*

> *remains early-stage laboratory work, advanced in a disciplined, capital-light way, with outstanding work from Dr Smirnova and the South Dakota School of Mines team.'*

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)	✓ Complete
Full-format pouch cell prototype - electrochemical baseline (charge/discharge vs. known reference).	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

NEXT STEPS

- **Complete pouch-cell performance testing**: Complete internal electrochemical testing of the full-format pouch cells now under evaluation — capacity, efficiency and cycle life — to establish a full-format performance result, with outcomes to follow.

- **Optimise and independently validate**: Refine the cell and deposition process on internal results, then submit the optimised baseline cell for independent third-party electrochemical testing to establish a validated performance baseline.

- **Integrate the solid electrolyte**: Replace the liquid baseline with CRR's ASE thin-film electrolyte — deposition is now underway — building towards a full solid-state cell.

- **ASE and HTE via DSD**: Advance trials depositing the ASE and HTE electrolytes using the dry DSD process — the manufacturing endpoint that unifies the sulphur-free solid-state electrolyte with the DSD manufacturing workstream.

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 DSD cathode technology is drawn from peer-reviewed research published in Electrochimica Acta (Rodmyre et al., 2026) and fairly represents that published work. 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, Technical Advisor to Critical Resources, and a co-author of the publication — has reviewed and approved the technical information in this announcement and consented to its inclusion 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.