

FIREBIRD SIGNIFICANTLY IMPROVES LITHIUM-MANGANESE-RICH (LMR) PRECURSOR QUALITY

Sulphur reduced by approximately 46% alongside significant improvements in LMR precursor tap density and particle-size morphology

Highlights

- **Improved pristine LMR precursor quality strengthens Firebird's pathway towards commercialisation**, with tap density reaching 1.35 g/cm³, **35% above previously reported Firebird results**, and **11% above a commercial reference**.
- **Sulphur content reduced by approximately 46% to 610 ppm**.
- **Firebird believes it is among the first Western-listed companies to publicly report performance data for proprietary LMR battery materials**.
- **LMR battery technology can be applied in a wide range of applications** including passenger and commercial EVs, robotics, defence, stationary energy storage and aviation.
- **Improved tap density may allow more active material, and therefore more energy, to fit within the same electrode volume**.
- **Consistent key performance indicators reported** across three batches support progress towards reproducible production, providing a **stronger foundation for scale-up and future customer qualification**.
- **The results complement Firebird's ultra-high-purity manganese sulphate capability**, supporting its strategy to develop an integrated supply of manganese chemicals, precursors and advanced cathode materials.
- **Proposed replication at the Australian Demonstration Plant would advance Australian manufacturing capability**, supporting future commercial licensing, joint venture partnering and commercial production opportunities.



Figure 1. Firebird's proprietary and integrated lithium manganese rich (LMFP & LMR) cathode process commences with the production of ultra-high-purity manganese sulphate (UHPMS).

Australian-owned Firebird Metals Limited (“FRB”, “Firebird” or “the Company”) is pleased to report progress in the development of manganese-rich nickel-manganese hydroxide precursors for lithium-manganese-rich (LMR) cathode materials at its Hunan research and development facility in China.

Tap density measures how much powder packs into a defined volume. Higher tap density may help a battery cathode material store more energy in a given volume, provided its electrochemical performance is maintained. If improved packing translates into higher finished electrode density, the same capacity may be achieved with a thinner cathode coating.

Firebird’s further optimisation of co-precipitation and washing conditions has improved precursor tap density, particle-size distribution and impurity control relative to the Company’s 28 July 2026 announcement. As a next step, these results support progression to downstream LMR cathode synthesis and testing.

Both General Motors and LG Energy Solution (LGES) have announced plans to develop LMR battery technology. Firebird believes it is among the first Western-listed companies to publicly report performance data for proprietary LMR battery materials and aims to be a key supplier of advanced high-performance manganese battery materials into multiple industries.

Improved LMR precursor quality

The precursor is produced using ammonia-complexed co-precipitation, with nickel and manganese salt solutions, ammonia and an alkaline solution fed into a controlled reaction system. The material is then aged, separated, washed and dried. The Firebird team has refined reaction conditions and washing temperature, frequency and duration to improve particle formation and reduce residual impurities.

Table 1. Firebird LMR precursor test results.

Parameter	Result
Tap density	1.35 g/cm ³
Sulphur	0.061% (610 ppm)
Sodium	0.016% (160 ppm)
Particle size D10	2.911 µm
Particle size D50	4.193 µm
Particle size D90	6.022 µm
Particle-size span	0.742
BET surface area	18.1 m ² /g

The tap density of 1.35 g/cm³ exceeds the team’s previously announced results by 35% and are 11% above a commercially available reference. The particle-size results and scanning electron microscope (SEM) observations of predominantly rounded secondary particles with structured surfaces indicate improved particle formation and process control (Figure 2).

Furthermore, these results achieved a 46% reduction in sulphur content to 610 ppm. Sulphur is a key impurity that can adversely affect battery performance. Introduced during synthesis, its removal requires a series of effective washing steps.

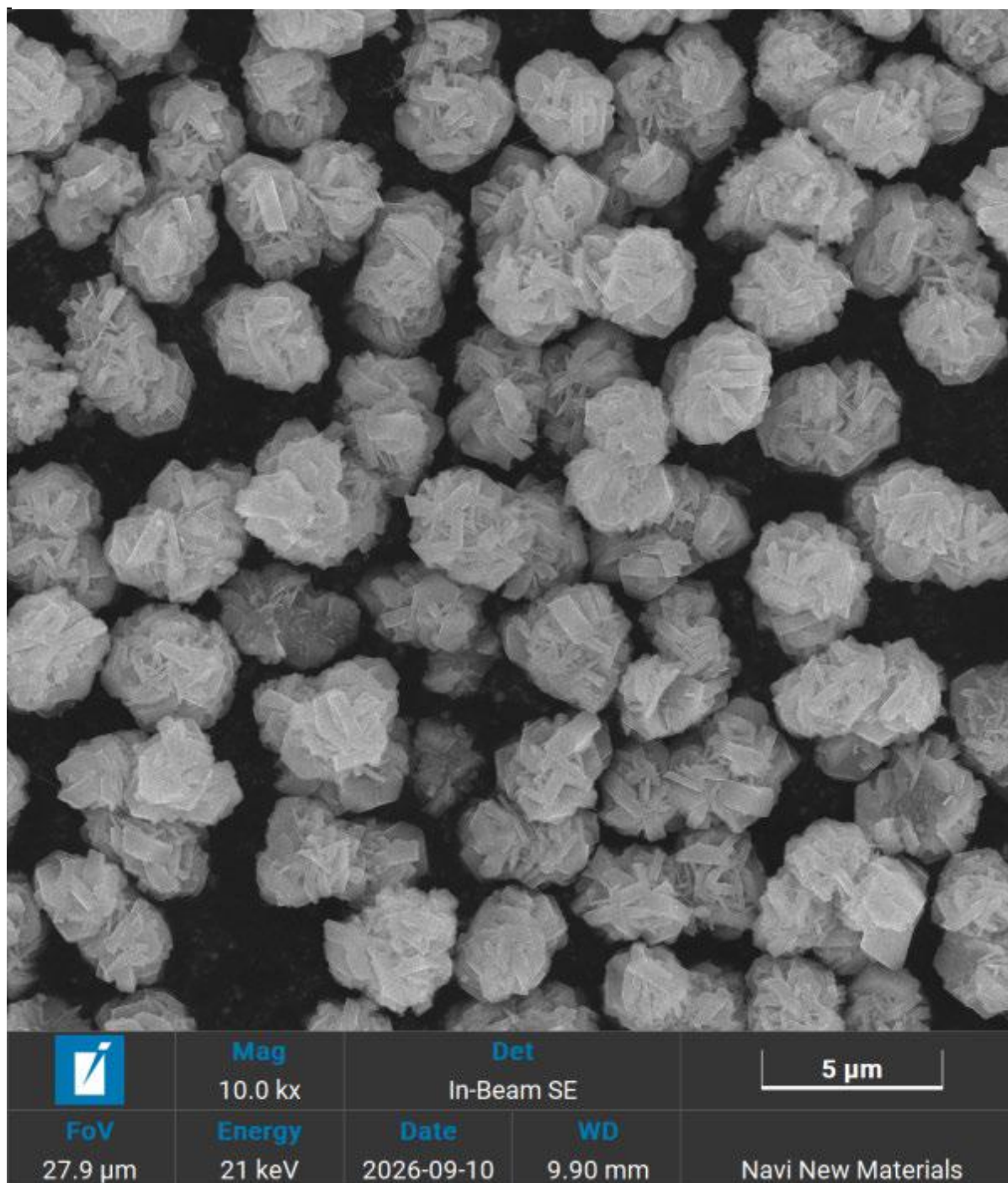


Figure 2. SEM image of Firebird LMR particle morphology showing uniform size and rounded structured surfaces.

The Firebird team reports consistent key indicators across three batches. This is an encouraging indication of repeatability, although the detailed independent results above relate to one sample and do not independently establish performance across all three batches.

Integration with high-purity manganese processing

This program has reinforced the importance of feedstock purity and impurity control in precursor manufacture. Firebird's ultra-high-purity manganese sulphate processing capability could complement its LMR precursor development and support its integrated pathway from manganese feedstock to advanced battery materials.

Controlled comparative trials are required to determine how specific manganese sulphate purity levels influence precursor characteristics and subsequent cathode performance. The current results do not establish a direct causal relationship between a particular feedstock purity level and the reported precursor improvements.

Australian demonstration and next steps

Firebird proposes to replicate the LMR precursor production process at its Australian Demonstration Plant (ADP) in Perth to assess production consistency, reagent efficiency, material yields and product quality at larger scale. This work would support subsequent customer qualification activities.

The proposed development pathway comprises:

Prove the process through further batch validation, lithiation and calcination trials, followed by assessment of cathode structure and electrochemical performance. Demonstrate reproducibility at larger scale through the ADP, including assessment of operating requirements and process economics. Commercialise through customer qualification and project-specific evaluation of product specifications, scale-up requirements and commercial arrangements. Further development, scale-up and customer qualification are required before commercial application can be established. Firebird will provide updates as this important program progresses.

Firebird CEO, Mr Ron Mitchell, commented:

"These results mark an encouraging step in Firebird's LMR development program. Higher precursor tap density, reduced sulphur and the consistency reported across this process provide a stronger foundation for the next stage of LMR cathode synthesis and testing. To be among the first Western companies to report performance metrics in relation to our LMR technology platform is particularly encouraging. Our aim is not to compete with existing battery companies or OEMs but instead to be a preferred supplier of choice for advanced manganese battery materials which demonstrate both high performance and competitive cost."

“Our focus is to prove the process, demonstrate its repeatability at larger scale and build the technical evidence required for commercialisation. Replication at our Perth Australian Demonstration Plant is the proposed next step in demonstrating this capability in Australia and supporting future customer qualification and commercial partnering initiatives.”

LMR battery technology applications

LMR battery technology has the potential to be applied in a wide range of applications where it aims to combine high energy density with lower cathode material costs (Table 2).

Table 2. Potential applications for LMR battery technology.

Battery segment	Potential application and benefit	Commercial position
Passenger EVs, SUVs and pickups	Longer range or smaller battery packs, with reduced reliance on nickel and cobalt compared with conventional high-nickel cathodes.	Strongest demonstrated market interest. GM and LG Energy Solution are targeting electric trucks and full-size SUVs.
Commercial vehicles	Delivery vans and fleet vehicles where range, payload and battery cost influence operating economics.	Potential extension of automotive applications; requires durability and charging validation.
Robotics and autonomous systems	Longer operating time within constrained battery weight and volume, including mobile and humanoid robots.	Prospective application; power delivery and cycle life must meet operating requirements.
Defence and portable power	Soldier-carried equipment, unmanned systems and mobile power where reducing battery weight could be valuable.	Prospective application; requires demanding safety, reliability and environmental performance.
Stationary energy storage	Compact storage systems where footprint matters.	Conditional opportunity; lifetime energy cost, cycle life and safety would determine competitiveness.
Specialist mobility and aviation	Drones and other platforms where battery weight limits endurance.	For applications requiring high specific energy alongside power and safety performance.

This announcement has been authorised for release by the Board of Firebird Metals Limited.

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About Firebird Metals Limited (ASX:FRB)

Firebird is an Australian battery materials technology company developing **advanced manganese-based lithium-ion battery materials** for the EV and energy-storage markets. Its proprietary, patented and exclusively licensed technology enables the direct processing of manganese concentrate to cathode active materials (CAM) within a single integrated process line, pairing a high-efficiency kiln and advanced crystallisation with downstream processing know-how to target **lower cost and energy use**.

The Company's immediate focus is delivery of its **Australian Demonstration Plant (ADP) in Perth, supported by a \$2 million grant from the Australian Renewable Energy Agency (ARENA)** under the Battery Breakthrough Initiative. The ADP, Australia's first demonstration-scale facility processing manganese concentrate into high-purity manganese sulphate (HPMSM) and downstream battery materials, including CAM, is advancing rapidly through 2026. It builds on Firebird's operating pilot facility, which has demonstrated the full flowsheet from manganese ore to high-performance CAM, and will validate the process under Australian conditions while delivering HPMSM and cathode samples for customer qualification.

Firebird is advancing near-term HPMSM production for the lithium manganese iron phosphate (LMFP) market, alongside a lithium manganese rich (LMR) program for next-generation cathodes.

Firebird also holds 234 Mt of manganese resources in Western Australia, led by Oakover (176.7 Mt at 9.9% Mn, including Indicated 105.8 Mt at 10.1% Mn¹) and Hill 616 (57.5 Mt at 12.2% Mn²). The Company has the flexibility to source manganese ore through third-party suppliers and stockpiles, with mining optionality retained within its broader portfolio.

JORC Compliance Statement

This announcement contains references to Mineral Resource Estimates, which have been reported in compliance with Listing Rule 5.8 and extracted from previous ASX announcements as referenced. The Company confirms that it is not aware of any new information or data that materially affects the information previously reported and that all material assumptions and technical parameters underpinning the Mineral Resource Estimates continue to apply and have not materially changed.

¹ See ASX announcement dated 23 March 2023: Indicated Resource of 105.8Mt at 10.1%; Inferred Resource of 70.9Mt at 9.6% for global Resource of 176.7 Mt at 9.9% Mn.

² See ASX announcement dated 1 December 2021: Inferred Resource of 57.5 Mt at 12.2% Mn.