MTM CRITICAL METALS

MTM Critical Metals Limited
Suite 2, 38 Colin Street
West Perth WA 6005

Phone +61 8 6391 0112
info@mtmmetals.com.au
ABN 27 645 885 463

ASX: MTM

mtmcriticalmetals.com.au

ASX RELEASE

6 May 2024

FLASH JOULE HEATING PROTOTYPE TEST SIGNIFICANTLY INCREASES REE RECOVERY (Amended)

Initial FJH prototype testing shows material improvement in metal recovery from coal fly ash

---

Highlights:

- Flash Joule Heating (FJH) prototype testing has produced significant increases in the acid leachability of Rare Earth Elements (REE) and target Critical Metals from Coal Fly Ash (CFA) samples.
- CFA samples treated by the FJH prototype delivered a +50% increase in the recovery of REE and Critical Metals.
- Initial testing successfully conducted at 50x scale up from Rice University's proof of concept.
- Ongoing testing will provide technical and performance data for MTM to progress the design of the Pilot FJH Plant.
- MTM will conduct additional Prototype FJH testing on waste sources of REE and Critical Metals including Bauxite Residue, E-Waste and end of life Lithium-Ion Batteries

---

MTM Critical Metals Limited (ASX:MTM) (MTM or the Company) has received results from testing of coal fly ash (CFA) samples using Flash Joule Heating (FJH). FJH processes improve the acid leachability of rare earth elements (REE) by over 50% and a range of critical metals by between 50% and 514% when compared to traditional acid leach methods.

MTM Chairman, Mr John Hannaford said: *"These promising initial results from coal fly ash samples treated with flash joule heating show the value in our recent acquisition that included this industry-leading technology. This innovative approach holds the potential to transform the current methods used by the industry to recover critical metals from waste materials. We look forward to providing updates on the technology, as we scale operations to service a range of applications."*

Flash Metals USA President, Mr Steve Ragiel said: *"We are thrilled with the progress of our Flash Joule Heating prototype testing, demonstrating significant increases in the extraction of rare earth elements and critical metals from coal fly ash. We have validated the Rice University results, showing the technology has the potential to dramatically increase the leaching recovery of metals from waste materials that are otherwise very difficult to treat, all while using significantly less acid. Processing of samples from additional metals remains ongoing. We look forward to continuing our testing and advancing towards commercial scale opportunities."*

MTM CRITICAL METALS

Test work method and results

The FJH protype unit was designed and fabricated by KnightHawk Engineering (KnightHawk) in Houston, Texas and verified in consultation with the developer of the technology, William Marsh Rice University (Rice) a prominent industrial technology research institution also based in Houston. The Prototype sample test volumes represent an approximate 50x increase in scale versus previous proof of concept testing performed by Rice.

Approximately 60 kilograms of coal fly ash (CFA) sourced from North Dakota, USA, was utilised as a basis for the current round of FJH testing. The CFA samples were tested using both a standard leach process to determine an approximate metal recovery using conventional acid leach methods, as well as treating the CFA with the FJH technology.

Preliminary results showed that the CFA treated with FJH resulted in a 50% recovery increase in REE, and importantly, a 72% increase for neodymium when compared to control samples. Several other important critical metals also showed enhanced leach recoveries, including cobalt (+73%), lithium (+50%), nickel (+99%), rubidium (+113%), scandium (+103%) and titanium (+514%). **This is of particular significance given the current market price of Rubidium is $108,000/kg[1] and the MREE element Neodymium, is currently US$68,800/tonne[2].**

Importantly, the CFA material treated with FJH technology shows significant promise for delivering higher recoveries in the leaching process when compared to recovery processes on the same material which has not undergone FJH processing. The ability of FJH to reduce the acid requirements in the leaching process offers both potential cost savings and for the generation of less waste. Future testing will be able to quantify both the energy and reagent savings in the leaching process.

MTM, in conjunction with KnightHawk and Rice University, will continue to test CFA samples using the data to help refine and improve the technology with the aim of increasing recovery rates. The technical and performance data from these tests will provide valuable information for MTM to advance the design of a larger Pilot FJH Plant.

MTM will also look to commence testing of the FJH technology on other waste sources of REE and critical metals including bauxite residue (red mud), e-waste and end of life lithium-ion batteries. The initial results from the prototype testing, coupled with the strong pricing dynamics of the metals recovered from the CFA material, highlight the economic potential of FJH.

Flash Joule Heating

FJH is an advanced processing and recycling technology being developed to extract critical metals including REE, titanium, nickel, cobalt and lithium from waste material including lithium-ion batteries, e-waste, coal fly ash produced by coal-fired power stations or bauxite residue derived from alumina refining.

The FJH technology is an electro-chemical process that involves the rapid and intense heating of material to both directly recover critical metals and make materials more amenable to metal recovery through conventional acid leaching methods. **The FJH technology that is being licensed to MTM uses proprietary**

---

[1] Shanghai Metals Market - Rubidium (Rb>99.5%) https://www.metal.com/Other-Minor-Metals/202012250003 as at 2/5/2024 (US$3,099/oz)

[2] Shanghai Metals Market - Neodymium (99.0-99.9%) https://www.metal.com/Rare-Earth-Metals/201102250470 as at 2/5/2024

MTM CRITICAL METALS

intellectual property in the flash process enabling the extraction of various metals including REE's, Lithium and other valuable precious and industrial metals. The FJH technology incorporates a range of patent protected processes around the material preparation, energy application and vaporized component separation and collection which can be scaled due to the precise control that the FJH prototype module provides.

MTM has secured the option over the FJH technology via the recent acquisition of Flash Metals Pty Ltd and the Company is currently finalising a global licencing agreement with Rice.

***Table 1:** Selected CFA leaching results showing the positive effect on metal recovery using FJH technology.*

Element		Head Grade (SGS - ppm)	Leach Recovery Results (Pre FJH) (µg/L)	Leach Recovery Results (Post FJH) (µg/L)	% Change in Recovery
Rare Earth Elements (REE)	Nd - Neodymium	72	637	1,095	72
	Pr - Praseodymium	18	188	285	52
	Dy - Dysprosium	14	367	444	21
	Tb - Terbium	2	41	62	50
	TOTAL MREE	**106**	**1,233**	**1,886**	**53**
	Ce - Cerium	153	1,482	2,377	60
	Er - Erbium	8	277	350	26
	Eu - Europium	3	37	56	50
	Gd - Gadolinium	16	256	367	44
	Ho - Holmium	3	86	121	40
	La - Lanthanum	74	752	1,197	59
	Lu - Lutetium	1	65	79	22
	Sm - Samarium	15	149	232	55
	Tm - Thulium	1	44	58	31
	Y - Yttrium	81	1,346	1,961	46
	Yb - Ytterbium	7	319	381	20
	TOTAL REE	468	6,046	9,065	50
Other Elements of Interest	*Al – Aluminium **(%)****	**10*	5,814,146	9,497,618	63
	Ba - Barium	978	4,777	3,499	-27
	Co - Cobalt	45	558	964	73
	Cs - Cesium	7	120	333	176
	Li - Lithium	125	3,248	4,857	50
	Ni - Nickel	102	1,214	2,412	99
	Rb - Rubidium	93	1,141	2,427	113
	Sc - Scandium	27	694	1,409	103
	Ti - Titanium	5,900	1,626	9,990	514
	V - Vanadium	205	6,052	1,320	-78

Notes:

- Results are preliminary and un-optimised.
- Head Grade composition of CFA measured by SGS on a component specific basis (Note Appendix I).

- * Aluminium is reported in percentage due to the high amount of Aluminium content within the CFA sample for SGS values.
- Appropriate rounding has been applied to the reported values.
- The "Leach Recovery Results (Pre FJH)" and "Leach Recovery Results (post FJH)" data were measured using the KnightHawk standard Acid Leaching procedure (Appendix II) and the PerkinElmer TotalQuant semi-quantitative ICP-MS procedure (Appendix III) and are typically within ±30% of the quantitative values.
- In the coming weeks, KnightHawk Engineering expects to have more quantitative results utilising detailed calibration curves for ICP-MS data refinement.
- MREE – Magnetic Rare Earth Elements.

This announcement has been authorised for release by the Board of Directors.

For further information, please contact:

Investors
Craig Sainsbury
Automic Markets
+61 428 550 499
craig.sainsbury@automicgroup.com.au

Media
Tristan Everett
Automic Markets
+61 403 789 096
tristan.everett@automicgroup.com.au

About MTM Critical Metals Limited

MTM Critical Metals Limited is an exploration company which is focused on searching for niobium (Nb) and rare earth elements (REE) in Western Australia and Québec. Additionally, the Company has acquired an option to exclusively negotiate the licencing rights to an early-stage processing technology for REE and precious metals known as Flash Joule Heating, which has been developed by researchers at Rice University, USA. MTM's West Arunta Nb-REE licences lie within one of Australia's critical metal exploration hotspots where over $60m in exploration expenditure has been collectively invested in the district by a number of ASX companies including WA1 Resources Limited (ASX:WA1), Encounter Resources Limited (ASX:ENR), Rio Tinto Limited (JV with Tali Resources Pty Ltd) (ASX:RIO), CGN Resources Limited (ASX:CGR), and IGO Limited (ASX:IGO). The Company also holds tenements in other prolific and highly prospective mineral regions in Western Australia. The Mukinbudin Nb-REE Project comprises two exploration licences located 250km northeast of Perth in the South West Mineral Field of Western Australia. The East Laverton Projects is made up of a regionally extensive package of underexplored tenements prospective for REE, gold and base metals. The Mt Monger Gold Project comprises an area containing known gold deposits and occurrences in the Mt Monger area, located ~70km SE of Kalgoorlie and immediately adjacent to the Randalls gold mill operated by Silver Lake Resources Limited. In Québec, the Pomme Project is a known carbonatite intrusion that is enriched in REE and niobium and is considered to be an extremely prospective exploration target adjacent to a world class REE resource (Montviel deposit). The Company has an experienced Board and management team which is focused on discovery to increase value for shareholders.

About KnightHawk Engineering

KnightHawk was founded in 1991 and specializes in identifying high technology solutions in a short timeframe. They have executed projects throughout the United States, Europe, and Asia. Their clients range from individual entrepreneurs to the large industrial organisations such as Shell, Exxon Mobil, Chevron and NASA. They have a depth of experience and expertise and are leaders in design, failure analysis and troubleshooting across a range of engineering disciplines. KnightHawk was selected for its expertise across a wide range of disciplines and their focus on ensuring outcomes in a timely manner.

Previous Disclosure

The information in this announcement is based on the following MTM Critical Metals Limited ASX announcements, which are all available from the MTM Critical Metals Limited website www.mtmcriticalmetals.com.au and the ASX website www.asx.com.au.

Date	Description
27 March 2024	Flash Metals Acquisition, Tranche 2 of the Placement and Convertible Note Settlement Completed
3 April 2024	Flash Joule Heating Prototype Complete, Testing Commenced

The Company confirms that it is not aware of any new information or data that materially affects the information included in the original ASX announcements and that all material assumptions and technical parameters underpinning the relevant ASX announcements continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are represented have not been materially modified from the original ASX announcements.

Cautionary Statement Regarding Values & Forward-Looking Information

The figures, valuations, forecasts, estimates, opinions and projections contained herein involve elements of subjective judgment and analysis and assumption. MTM Critical Metals does not accept any liability in relation to any such matters, or to inform the Recipient of any matter arising or coming to the company's notice after the date of this document which may affect any matter referred to herein. Any opinions expressed in this material are subject to change without notice, including as a result of using different assumptions and criteria. This document may contain forward-looking statements. Forward-looking statements are often, but not always, identified by the use of words such as "seek", "anticipate", "believe", "plan", "expect", and "intend" and statements than an event or result "may", "will", "should", "could", or "might" occur or be achieved and other similar expressions. Forward-looking information is subject to business, legal and economic risks and uncertainties and other factors that could cause actual results to differ materially from those contained in forward-looking statements. Such factors include, among other things, risks relating to property interests, the global economic climate, commodity prices, sovereign and legal risks, and environmental risks. Forward-looking statements are based upon estimates and opinions at the date the statements are made. MTM Critical Metals undertakes no obligation to update these forward-looking statements for events or circumstances that occur subsequent to such dates or to update or keep current any of the information contained herein. The Recipient should not place undue reliance upon forward-looking statements. Any estimates or projections as to events that may occur in the future (including projections of revenue, expense, net income and performance) are based upon the best judgment of MTM Critical Metals from information available as of the date of this document. There is no guarantee that any of these estimates or projections will be achieved. Actual results will vary from the projections and such variations may be material. Nothing contained herein is, or shall be relied upon as, a promise or representation as to the past or future. MTM Critical Metals, its affiliates, directors, employees and/or agents expressly disclaim any and all liability relating or resulting from the use of all or any part of this document or any of the information contained herein.

Appendix I – Coal Fly Ash Composition – SGS methodology

Method Summary

Number of Samples	Method Code	Description
3	G_WGH_KG	Weight of samples received
3	GE_FAI31V5	Au, Pt, Pd, FAS, exploration grade, ICP-AES, 30g-5mL
3	GE_ICP91A50	Na_2O_2/NaOH Fusion, 500°C, HNO_3, ICPAES, 0.1g-50ml, Glassy Carbon crucibles
3	GE_IMS91A50	Na_2O_2/NaOH Fusion, ICP-MS, Glassy Carbon crucibles
3	GE_CSA06V	Total Sulphur and Carbon, IR Combustion
3	GE_IMS21B20	Aqua Regia Digest (HCL/HNO_3) ICP-MS
1	GO_ICP90Q100	Ore grade Na_2O_2 Fusion, HNO_3, ICPAES, 0.2g-100ml

SGS Canada Minerals Barnaby conforms to the requirements of ISO/IEC17025 for specific tests as listed on their scope of accreditation found at https://www.scc.ca/en/search/laboratories/sgs
Tests and Elements marked with an "@" symbol in the report denote ISO/IEC17025 accreditation.

Appendix II – Acid Leach Testing

KnightHawk Standard Procedure Summary

1. Weigh the total mass of the sample
2. Sieve through 425 μm mesh to prepare 8.00 grams of powdered sample for acid wash.
3. Prepare 75 mL of 1.00 M HNO_3 Acid in De-ionized water.
4. Mix the powdered sample with acid and measure the total mixture volume as pre-wash volume.
5. Heat mixture to 95 °C and maintain at temperature with covering for 4 hours.
6. Allow mixture to cool and measure total mixture volume as post-wash volume.
    - The acid volume lost during the heating process is calculated by equation Eq1.

$$mL_{Lost} = mL_{PreWash} - mL_{PostWash}$$
(Eq1)

    - The acid volume is normalized for each test *N* by the ratio in equation Eq2.

$$C_N = \frac{75mL - mL_{Lost}}{75\ mL\ Standard}$$
(Eq2)

7. Separate solution and filter with 0.4 μm material.
8. Measure the pH of the filtered solution to record acid strength.

Appendix III – Leach Test Results

ICP-MS Analysis Procedure Summary

1. Filter the sample through a 25 mm Diameter 0.2 µm PVDF membrane syringe filter.
2. Dilute the sample with 2% HNO3 Acid by a 1001x ratio for analysis by ICP-MS.
3. Prepare ICP-MS equipment prewash with 2% HNO_3 and daily standard solution for checks on calibration.
4. Conduct PerkinElmer TotalQuant semi-quantitative multi-elemental analysis in ICP-MS.
    - Leach Recovery Results for each element *i* and each test *N* are solved via equation Eq3.

$$LRR_{iN} = \frac{[ICP{-}MS\ Output]\ \mu g_i}{1\ L_{ICPS}} * \frac{1001\ L_{ICPS}}{1\ L_{AcidWash}} * C_N$$

(Eq3)