

Marimaca Announces Results from Phase 6 Metallurgical Program

06.11.2023 | [GlobeNewswire](#)

VANCOUVER, Nov. 06, 2023 - [Marimaca Copper Corp.](#) ("Marimaca Copper" or the "Company") (TSX: MARI) is pleased to announce results of the Phase 6 Metallurgical testing program (the "Phase 6 Program" or the "Program") for the Company's flagship Marimaca Oxide Copper Project ("the MOD" or "the Project"), located in northern Chile.

The Phase 6 program was designed to evaluate leaching conditions to optimize acid consumption, recoveries and leaching efficiency to be incorporated into the ongoing Definitive Feasibility Study ("DFS").

Highlights

- Comprehensive 5 column-test program evaluating the impact of curing, leaching rates and acid concentration in solution on acid consumption, recoveries and impurities generation
- Significantly improved acid consumption based on optimization of leaching conditions
 - Net acid consumption of 30.6kg/t from experimental samples - an approximate 25% reduction from the 40.6kg/t derived from previous metallurgical campaigns
 - Provides further confidence in expected acid consumption with clear potential to enhance operating cost profile for the DFS
- Confirms average copper recovery of 74.9% - in-line with previous results from metallurgical campaigns (Phases 1-5)
- Flexibility for further reductions in acid consumption with relatively low recovery losses
- Program completed with recycled sea-water sourced from Marimaca's intended water supplier under its water option agreement to accurately reflect process water to be utilized at the Project
- Further de-risking of the Marimaca metallurgy - allows for improved predictability of metallurgical performance during operations
 - Results will be incorporated into the final geo-metallurgical model to be utilized in the DFS which will define, at high resolution, the metallurgical performance of each ore-feed type in the DFS
- Results demonstrate the self-regulation of impurities in the leaching cycle which allows for simple SX-EW process design and capital efficiency for the planned DFS

Hayden Locke, President and CEO of Marimaca Copper, commented:

"We are pleased with the Phase 6 metallurgical results and particularly the implications for acid consumption optimization in the DFS and in future operations.

Acid consumption is a key component of our operating costs, and fluctuations in acid price were identified as a core external factor in our projected operating margins as we move towards first copper. The results from this program show, firstly, that our base case assumptions, with respect to acid consumption, can be materially reduced via simple changes to our operational approach with no significant impact to our expected recoveries.

Secondly, the testing highlights that we have further flexibility to reduce acid consumption, with relatively small recovery losses. From my perspective, this is the most important outcome from the testing, because it allows us to make operational changes to preserve margin and cashflow during periods of high acid prices, which increases the resilience of the Project to external shocks.

"The Marimaca Project continues to demonstrate unique positioning in the copper development space. We are excited to move through the final development milestones as we rapidly advance toward first copper."

Program Overview

Phase 6 Metallurgy comprised of a set of leaching tests in five 1m high, 6-inch diameter columns. The sample set consisted of green oxides comprised 50% brochantite/atacamite and 50% chrysocholla with a total sample size of 240kg which was crushed at P90 ½", consistent with previous metallurgical test-work phases. The sample was subjected to separation by sieving, in the ½", ¼", 10 and -10 Tyler meshes, and then, from each granulometric fraction, a sample size was taken as required to form the program design cut under the standardized "cut by mono size" technique.

Process seawater used in the column tests was sourced from the counterparty to Marimaca's water option agreement to accurately represent the industrial process water that will be used at the Marimaca operation (see Water Option press release dated November 7, 2022). The leaching conditions were focused on variables to optimize acid consumption. The two variables controlled were acid dosing in curing step, and the Leaching Ratio (m³ irrigate solution/tonne ore). The head grade of the ore, the grade of ripios resulting from leaching, the initially acidified seawater, the pregnant leaching solution ("PLS") and the raffinate solutions were each characterized by the elements for which the evolution of impurities was monitored. The evolution of impurities was quantified by determining the concentration in the PLS solutions of the following elements: FeT, Al, Mg, Mn, Na, Cl- and SO4= and Cu. Cu was removed from the PLS solutions by solvent extraction (SX), at the end of each leaching cycle.

Column Tests

Results were evaluated from two leaching cycles over five columns. In both irrigation cycles, the tests operate in a closed circuit with a volume of irrigation solution equivalent to 10 days of operation, which, at an irrigation rate of 10 L/h/m² is equivalent to a leaching rate of 0.93m³/to (approximately) for each cycle and 1.86 m³/t in total.

Column 1 (C-1) and Column 2 (C-2) were leached with seawater and acid in the first cycle, then the PLS obtained was treated by solvent extraction and the raffinate produced was used for the second leaching cycle. The PLS from the second cycle of each column (C-1 and C-2) was then treated by solvent extraction (SX) and both raffinate solutions produced were mixed and used as the leaching solution for Column 3 (C-3). The post-SX raffinate of the C-3 PLS was used to leach Column 4 (C-4) and similarly for C-4 to Column 5 (C-5).

Each column was agglomerated and cured under identical conditions, summarized in Table 3.

Table 1. Sample Set Mass Allocation

Usage	Unit	Value
Columns	kg	150 (5x30kg)
Head Grade	kg	10
Back Up	kg	80 (4x20kg)

Table 2. Particle Size Distribution of Sample Set

Granulometric Mass (kg)						
Fraction	C-1	C-2	C-3	C-4	C-5	Backup
1/2"	3.25	3.25	3.25	3.25	3.25	8.66
1/4"	9.51	9.51	9.51	9.51	9.51	25.37
+10 #	8.62	8.62	8.62	8.62	8.62	22.97
-10 #	8.62	8.62	8.62	8.62	8.62	22.99
TOTAL	30.0	30.0	30.0	30.0	30.0	80.0

Table 3. Agglomeration and Curing Conditions

Parameter	Unit	Value
Moisture (Seawater) %		6

Acid Dose Curing kg/ton 20
Curing Time days 3

Following the irrigation cycle in each column, the solution contained inside the column was allowed to drain, and the ripios were washed by passing a seawater solution at pH 3 at an irrigation rate of 10 L/h/m² for 24 hours. The drained volume was measured and analyzed for the same elements considered in the analysis of the PLS solutions.

Following drainage of the washing stage, the ripios were unloaded from the respective columns and the wet and dry weights were recorded. A subsample equal to a quarter of the total ripios sample was sent for chemical assays following separation.

Results

Acid Consumption

Acid consumption was measured by both total acid consumption (CAB) and net acid consumption (CAN). CAN reflects acid consumed only by the gangue minerals (carbonate, aluminium, total iron, magnesium) given raffinate is recirculated with the acid consumed by copper post the SX stage. Geomet 6 was designed to evaluate the optimization of acid consumption by evaluating three variables: acid curing rate (20kg/t), acid concentration (10gpl) and leaching ratio (1.86m³/t).

Results of the column test acid consumption is presented in Figure 1. Average CAB was 36.91kg/t while average CAN was 30.63kg/t.

Figure 1. Acid Consumption - Columns 1-5

By controlling the noted variables, acid consumption can be optimized given the sequential nature of consumption by each of the gangue minerals - for example, the majority of acid consumption in the curing stage is driven by carbonate, followed by copper, aluminum, total iron and magnesium predominantly during the leaching cycle.

Copper Recovery

Table 4 and Figure 2 show the calculated head and head/ripiio base copper recovery by columns. The average copper recovery of the 5 columns per head calculated was 74.9%, while the recovery per head/ripios was 73.0%. Results are in-line with expected results based on previous test-work and demonstrate that copper recovery can be maintained while optimizing the variables that reduce acid consumption and impurities generation.

Table 4. Column Recoveries

Column	Analyzed Cu Head Grade	Calculated Cu Head Grade	Fine Cu Analyzed Head Grade	Copper Leached	Copper in Ripios	Copper Calculated Head	Recovery Calculated from Head (R CC)	Recovery Calculated from Ripios (R C/R)
(N°)	(%)	(%)	(g)	(g)	(g)	(g)	(%)	(%)
C-1	0.620	0.568	186.00	122.64	47.74	170.4	72.0	74.3
C-2	0.620	0.628	186.00	139.47	49.03	188.4	74.0	73.6
C-3	0.620	0.638	186.00	143.68	47.74	191.4	75.1	74.3
C-4	0.620	0.718	186.00	166.72	48.83	215.4	77.4	73.7
C-5	0.620	0.815	186.00	186.3	58.05	244.5	76.2	68.8

Figure 2. Column Recoveries

Impurities Generation

The column tests were evaluated to determine the experimental evolution of impurities generation vs. the theoretical evolution of impurities generation to determine the equilibrium point of the system. This was studied to determine the expected performance of the SX-EW plant and its ability to handle the solution generation from leaching of Marimaca ores.

Results shows that as the recirculation of leaching solution occurs, as is the case in industrial operations, the capacity of the system to dissolve impurities decreases, which indicates that the system self-regulates before any impurities mitigation is required in the SX-EW process design. In industrial terms, by feeding the heap with fresh ore, the curing acid and the leaching solutions will dissolve new impurities, but simultaneously others will precipitate in the heap, and the system will reach equilibrium.

This concept is demonstrated in Figure 3. Whereby results from Geomet 6 show the experimental sulfate concentration in each cycle deviates and plateaus relative to the theoretical sulfate concentration with the correlation coefficient of the experimental results of 0.9992. When projecting the experimental curve 3 additional cycles, it can be observed that the sulfate saturation level is approximately 147 gpl.

Table 5. Evolution of Impurities Concentration in PLS solution

Column (Nº)	FeT (g/L)	Al ⁺³ (g/L)	Mg ⁺² (g/L)	Mn ⁺² (g/L)	Na ⁺ (g/L)	Cl ⁻ (g/L)	SO ₄ ⁼ (g/L)
C-1	6,54	3,14	3,49	0,25	13,15	27,55	46,21
C-2	6,18	3,03	3,21	0,20	12,55	26,67	44,76
C-3	9,61	5,40	4,03	0,37	13,42	28,81	74,98
C-4	13,50	6,99	5,61	0,57	16,05	31,43	103,37
C-5	17,52	10,34	6,80	0,80	18,53	38,16	120,32

Figure 3. Evolution of Sulfate Concentration in PLS solution

Appendix: Chemical Characterization of Experimental Inputs

Below the chemical characterization of the head sample, the seawater input, and the leaching solution are presented.

Table 6. Chemical Characterization of Head Sample

Elements	CuT (%)	FeT (%)	Al (%)	Mg (%)	Mn (%)	Na (%)	CO ₃ (%)	Cl ⁻ (%)	SO ₄ ⁼ (%)
Head Grade	0.641	7.66	6.72	1.05	0.07	3.09	0.63	0.25	0.15

Table 7. Chemical Characterization of Seawater Used

Element	Cu ⁺² (mg/L)	FeT (mg/L)	Al ⁺³ (mg/L)	Mg ⁺² (g/L)	Mn ⁺² (mg/L)	Na ⁺ (g/L)	Cl ⁻ (g/L)	SO ₄ ⁼ (g/L)	pH
Seawater	0,00	0,90	1,70	1,44	ND	11,33	23,21	2,10	7,60

Table 8. Chemical Characterization of the Initial Leaching Solution (for Columns C-1 and C-2)

	Cu ⁺²	FeT	Fe ⁺²	Al ⁺³	Mg ⁺²	Mn ⁺²	Na ⁺	Cl ⁻	H ⁺	pH	SO ₄ ⁼
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(g/L)	(mg/L)	(g/L)	(g/L)	(g/L)		(g/L)
Leach Solution	0,00	0,90	ND	1,70	1,44	ND	11,33	22,10	9,38	0,75	9,94

Qualified Person

The Qualified Person for technical information in this news release is Gabriel Vera, an extractive metallurgical engineer with over 35 years of experience. Mr. Vera is a registered member of the Comision Minera (Chilean Mining Commission) and a Qualified Person for the purposes of NI 43-101.

The QP confirms they have reviewed and approved the scientific and technical information related to metallurgy in this news release.

Contact Information

For further information please visit www.marimaca.com or contact:

Tavistock
+44 (0) 207 920 3150
Gareth Tredway / Adam Baynes
marimaca@tavistock.co.uk

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<https://www.goldseiten.de/artikel/599040--Marimaca-Announces-Results-from-Phase-6-Metallurgical-Program.html>

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