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RAWMINA Project Newsletter #5

Building an integrated, innovative pilot system for
recovery of critical raw materials from mine waste



Project News

**Invisible “metalworkers” to obtain critical materials
for our current civilisation**

Article by RAWMINA partner *Alfonso Mazuelos Rojas* from the *University of Seville (USE)*

wastes consist of sulphide minerals can be valorised by a process known as Bioleaching, thanks to very special microorganisms with the amazing ability to release valuable metals from minerals. To do this complex and hard work, all these invisible metalworkers (bacteria) need is air to breathe. You might be wondering, what do they eat to keep them alive? Believe it or not, they consider mineral substances, such as iron or sulfur, as food.

To obtain metals through bioleaching at a commercial scale, a massive microbial population is placed in specifically designed stirred tanks known as bioreactors, which are continuously fed with finely milled minerals suspended in water like a pulp. Simultaneously, air is injected into the pulp as bubbles which allows the bacteria to breathe. You can think of a bioreactor like an overpopulated city such as New York where the millions of citizens are very hardworking bacteria. In this bacterial “city”, there’s a very efficient shipment and trash collector services which is the flowing pulp that is constantly stirred and circulated.



Figure 1. Analogies between bioreactors-overcrowded cities and biofilm-honeycomb

Bacteria colonize the mineral attached to its surface, generating a porous and tri-dimensional structure known as biofilm which is like a honeycomb but instead of beeswax there are metabolites excreted by bacteria, mainly jarosites (we can also find jarosites on Mars!). Going back to our city analogy, biofilms are like the skyscrapers in Manhattan because they can host a very high concentration of microorganisms.

The European RAWMINA project is testing bioleaching applied to mining waste to obtain critical metals and valuable iron oxides. Experiments are conducted on a small scale, with only a few millilitres of pulp, to large-scale bioreactors, with a volume higher than 10.000 litres. As of right now, very promising results are coming in, and I hope that in the next RAWMINA newsletter, I can tell you that the RAWMINA consortium efforts were successful.

Read the **full-version** of the article [here](#).

Microorganisms serving innovation for the recovery of critical metals

Article by RAWMINA partners *A.G. Guezennec, D. Pino Herrera, F. Bodéan* from the *French Geological Survey (BRGM)*

Bioleaching is a hydrometallurgical process using microorganisms to extract metals from rocks. It has always been a key technology for the treatment of low-grade resources, with successful operation for more than 40 years to recover copper from under-economic ores, especially in South America, or cobalt from mine tailings in Uganda or Finland.

In the RAWMINA project, bioleaching marks the initial stage of the whole process flowsheet designed to recover critical metals and minerals from Spanish mine tailings. In particular, BRGM prepared several tons of sulfidic tailings and conducted a bioleaching demonstration at its piloting hall in Orleans, France, that lasted 10 weeks and allowed to treat 240kg of materials. Thanks to BRGM's expertise in bioleaching, the bacteria used in RAWMINA remained strongly active at a solid concentration of 15%, mirroring the conditions applied in current industrial bioleaching operations.

The project demonstrates the potential to recover critical metals and minerals from mine tailings, thereby addressing environmental concerns and enhancing resource utilisation. As the mining industry seeks more sustainable practices, bioleaching emerges as a promising avenue for transforming waste into valuable resources. Moving forward, continued research and development in bioleaching technologies will further unlock the potential of this process, offering new opportunities for the treatment and valorisation of different types of mine waste on a global scale.

Read the **full-version** of the article [here](#).



In case you missed us

RAWMINA @ Annual Meeting of the Cluster Hub *On Thursday, 16 November, during the 2023 edition of the Raw Materials Week, the twelve EU funded projects that constitute the Cluster Hub 'Materials for batteries' gathered for their annual event in Brussels*



The Cluster Hub has been initiated last year during the 7th edition of the Raw Materials Week. The main objective of the meeting was to meet and discuss the latest developments in the participating projects as well as the new challenges and opportunities discovered through the projects' lifetime. Nader Akil, Operations Manager at [PNO Innovation](#), inaugurated this second edition outlining the motivation behind the hub's establishment. He underlined the positive reception and sustained interest from various stakeholders keen on joining this initiative.

Co-organised by [RELIEF](#), [EXCEED](#), [ENICON](#) and [RAWMINA](#), the event was also the opportunity to welcome the four new members of the Cluster ([EXCEED](#), [RAWMINA](#), [METALLICO](#) and [CRM-geothermal](#)). the workshop gathered nearly 100 organisations driving the production and the recycling of raw materials for battery applications from primary and secondary resources.

Learn more and access the presentations [here](#).

RAWMINA partners @ Rio Tinto mines

February 2024



Blanca Perdigones, along with Alfonso Mazuelos Rojas and Nieves Iglesias from the University of Seville (USE) visited the facilities of Atalaya Mining S.A. at the start of February, which allowed them to disseminate the key aspects of the RAWMINA project to the company as a potential final user. During this visit with the highly esteemed company, some of the principles on which the RAWMINA project is based were presented, such as the generation of knowledge and technologies which promote circularity, the recovery of critical raw materials (CRMs) for their reincorporation into the production cycle, the application of clean technologies, the rational and integral use of water and the generation of non-ecotoxic and non-acid waste. USE had the opportunity to underline the relevance of the RAWMINA project in the self-sufficiency context regarding strategic materials and technologies, and in the new production model for the industrial transition postulated by the European Union.

“Frontier technologies for sustainable extraction of critical raw materials” *On Tuesday, 12 March 2024, RAWMINA and CRM Geothermal organised a online webinar focusing on critical raw materials recovery from mine waste and geothermal fluids.*



Frontier technologies for sustainable extraction of critical raw materials

Online

DATE
12 March
Tuesday

HOUR
10:00 - 11:30
CET



Funded by
the European Union



Raw Minerals Helix

Hosted by the RAWMINA project and CRM-geothermal, innovators in sustainable resource extraction discussed challenges and opportunities. Discussions were thought-provoking and inspiring, delving into cutting-edge technologies and innovative approaches, and sharing invaluable insights on how to responsibly extract critical raw materials while minimising environmental impact.

Find the recordings [here](#).

Coming up

SETAC Europe 34th Annual Meeting



UVIC will be representing the project RAWMINA at the upcoming SETAC Europe 34th Annual Meeting, scheduled from May 5th to 9th, 2024. UVIC's presentation will focus on "Mesocosms

project WP7 (Sustainability assessment and social innovation).

XXII AIL Meeting

XXII AIL MEETING
VIGO 2024
23 – 28th June

Our partner UVIC will be representing RAWMINA at the upcoming XXII AIL Meeting, scheduled to take place from June 23rd to 28th, 2024. UVIC will deliver a presentation titled "How to use mesocosms and multiparametric measurements based on biofilm responses in the environmental assessment of novel technologies for water treatment in the mining activity."

20th International Conference on Mineral Processing and Geometallurgy

Procemin-GEOMET 2024

Our partner TECNALIA will present results achieved in RAWMINA at the 20th International Conference on Mineral Processing and Geometallurgy, scheduled to take place from August 7-9, 2024, in Chile.

The 25th International Biohydrometallurgy Symposium

IBS

We're thrilled to announce that our partner, BRGM, will be participating in the upcoming "International Biohydrometallurgy Symposium 2024" (Halifax, Canada; August 2024) with an insightful topic titled "Gas-liquid mass transfer study of a bioleaching process in CSTRs to recover critical raw materials from mining wastes".

SFGP Congrès 2024



BRGM is set to make a significant contribution at the upcoming SFGP Congrès 2024 conference (Deauville, France; October 2024). Renowned for their expertise and innovation in the field of process engineering, BRGM's participation promises to enrich the discussions surrounding sustainable engineering solutions.

Interested in Raw Minerals Innovation?

Raw Minerals Open Innovation Helix



transitions. They form a strong industrial base, producing a broad range of goods and applications, both current and future.

Research into sustainable, reliable and resilient sources of CRMs and transfer of process technologies into use has never been more important.

Our members are currently targeting opportunities under Cluster 4 of Horizon Europe, seeking international collaborations relevant to the Raw Minerals community

Our community of researchers, technologists, innovators and policy makers continue to be active on the Crowdhelix platform. [Join free as an individual stakeholder from the link on the Helix page!](#) [Organisational memberships are required for some functions].

Visit and join the Helix!

Try your hand at the RAWMINA crossword

To end this newsletter, we'd like to invite you to enjoy a bit of geological trivia fun - the RAWMINA crossword 😊

Play the RAWMINA Crossword

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■ Answers

≡

Across

2. CRM refers to what type of Raw Materials? (8 letters)

5. A silver-coloured, brittle element, used extensively in the electronics industry. (8 letters)

8. The RAWMINA project has received funding from this European Union research and innovation programme. (7 letters,4 numbers)

9. The RAWMINA project focuses on mines and minerals representative of this peninsula. (7 letters)

Down

1. The first element in the periodic table named after a country. (9 letters)

3. Part of RAWMINA's mine waste valorisation aims is to recycle up to 90% of this precious resource. (5 letters)

4. Essential element for ensuring longer life span of batteries. (6 letters)

6. RAWMINA focuses on removing this mineral by means of magnetic separation. (4 letters)

7. Chile has the world's largest deposits of this mineral ore. (6 letters)

All the answers to the crossword can be found on the RAWMINA project website.



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