



EUROPEAN COMMISSION

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Industrial Transformation and Advanced Value Chains

Resource Efficiency and Raw Materials

Raw Materials Week 2019

18 November 2019, Le Plaza Hotel, Boulevard Adolphe Max 118-126, 1000 Brussels

Horizon 2020 Technology Success Stories

1. Nature of the meeting

This full day event took place on the first day of the Raw Materials Week, which gathered delegates from academia, business, NGOs and governments. The objective of the event was to offer a first-hand account of EU funded research and innovation. The event showcased a selection of projects funded under Horizon 2020 that are bringing tangible impact in the area of raw materials. It was structured in four sessions: raw materials exploration; raw materials extraction; raw materials processing; and a dedicated session for ERANET raw materials projects. The participants had the opportunity to put questions and discuss with the speakers at the end of each session.

2. Welcome and context of the meeting

The EC welcomed the attendees to the meeting and outlined the context and purpose of the event. European industry is the cornerstone of the EU's growth and competitiveness, and raw materials are crucial to many European industries. Securing a sustainable supply of minerals and metals, including critical raw materials and other high-tech metals, is key to the competitiveness of the European industries. Moreover, raw materials are necessary enablers for carbon-neutral solutions in all sectors of the economy, particularly sectors like e-mobility and renewable energy, and will therefore be essential for the European Green Deal. Demand for raw materials keeps growing, and so will the challenges associated to raw materials supply. In the period 2014 to 2018 the European Commission has invested ca. 500 M€ in research and innovation in the field of raw materials, in order to overcome a number of significant challenges along the raw materials value chain.

3. Session I: Raw materials exploration

The high costs of exploration activities, the location of new deposits (small, complex, very deep, or in extreme environments) and the geological uncertainty are currently major challenges in raw materials extraction. We can tackle some of these challenges with highly efficient and cost-effective, sustainable exploration technologies that can lower the cost and expand the reach of exploration activities. **SOLSA** (Sonic Drilling coupled with Automated Mineralogy and chemistry On-Line-On-Mine-Real-Time) – produced, and tested in the relevant environment, exploration prototypes that combine drilling, using sonic technique, and mineralogical and chemical characterisation of samples collected at the exit of the core drill.

Integrating and interpreting all the information available into new geo-models can also lead to a decrease in exploration costs. **HiTech AlkCarb** (New geo-models to explore deeper for High-Technology critical raw materials in Alkaline rocks and Carbonatites) – aims to establish a standard geo-model for alkaline rocks and carbonatites that could become the industry norm for exploration. Ultimately, their target is to improve exploration for rare earth elements and other critical raw materials (niobium, tantalum and hafnium).

UNEXMIN (Autonomous Underwater Explorer for Flooded Mines) – has developed and demonstrated a robotic system, fully autonomous and able to explore flooded deep mines. One of these robots was showcased next to the registration area, giving the participants a unique

opportunity to get an up-close look at it. The consortium will bring the development to the next level in the project UNEXUP (funded by the EIT Raw Materials), which will start in 2020.

Session II: Raw materials extraction

At the extraction step, the fact that new deposits are small, complex, and located at deeper locations, or more extreme environments, can jeopardise the techno-economic feasibility of mine deployment and operation. Access to these unexploited deposits requires novel mining solutions, sustainable and environmentally sound, that can be integrated with the processing step in an economically viable process.

X-Mine (Real-Time Mineral X-Ray Analysis for Efficient and Sustainable Mining) – is developing large-scale demonstrators (pilots) of novel X-Ray based sensors, integrated with sorting equipment and mine planning software - thus improving the efficiency and sustainability of mining operations. **SLIM** (Sustainable Low Impact Mining solution for exploitation of small mineral deposits based on advanced rock blasting and environmental technologies) – is deploying a mining solution, low impact and cost effective, based on a new generation of explosives and advanced automatic blast design. **IMPACT** (Integrated Modular Plant and Containerised Tools for Selective, Low-impact Mining of Small High-grade Deposits) – is demonstrating a new mining paradigm that makes viable the exploitation of small complex deposits, the so-called switch on switch off mining concept.

On the other hand, mining must comply with the highest environmental and health standards. Modern extraction strategies must envisage also measures that minimise or eliminate negative impact on the environment and the population. **ITERAMS** (Integrated mineral technologies for more sustainable raw material supply) - is developing new methods to isolate mining process waters from the adjacent water systems. Future mining operations will thus have a lower environmental and economic cost.

Session III: ERA-MIN2

The ERANET Cofund on raw materials ERA-MIN 2 is a public-public partnership seeking to strengthen the coordination and to find synergies between regional, national and European research and innovation programmes and funded activities in the area of raw materials. ERA MIN 2 is an excellent example of leverage of EU funding: for 5 M€ EU funding, 28 transnational R&I projects have already been granted 21 M€ public (national/regional) funding in the first two calls. Session III featured short presentations of nine research projects co-funded under ERA-MIN 2.

AMTeG (Advanced Magnetic full Tensor Gradiometer) - builds a highly sensitive magnetic measuring system that will enable discovering formerly undetectable deposits, in a sustainable way. **REWO-SORT** (Reduction of Energy and Water consumption of mining Operations by fusion of SORTing technologies LIBs and ME-XRT) – intends to optimise energy and water consumption of mining operations thanks to a new tool that integrates two sensing technologies. **BASH-Treat** (Optimization of bottom ash treatment for an improved recovery of valuable fractions) – develops an advanced process for the recovery of metals from incineration bottom ash residues fine fraction, which will be tested in relevant industrial environment. **BIOMIMIC** (Innovations for effective and selective metal recovery from complex waste matrixes) has combined metal precipitation and bio-sorption to treat red-mud leachate and remove heavy metals, namely vanadium and gallium, critical metals with high potential for the economy. **EXTRAVAN** (Innovative Extraction Vanadium) - has demonstrated novel approaches for the efficient recovery of vanadium from primary and secondary raw materials.

MONAMIX (New concepts for efficient extraction of mixed rare earths oxides from monazite concentrates and their potential use as dopant in high temperature coatings and sintered materials) – evaluates mixed rare earths oxides as dopants, as replacement for individual rare earth oxides. This approach has the potential to reduce production costs by 10-15%.

MaXycleE (A novel circular economy for sustainable RE-based magnets) - proposes and validates a systematic approach to recycling end-of-life NdFeB magnets, with the ambition to improve the circularity of these magnets at industrial scale. **MetRecycle** (Recycling of metals using functionalized magnetic nanoparticles) – targets selective and efficient recycling of rare earth elements from waste waters thanks to functionalized magnetic nanoparticles. **SUPERMET** (Recovery of Precious Metals from Spent Catalysts by Supercritical CO₂ Extraction Assisted by Polymers) - proposes an eco-friendly disruptive technology for the recycling of precious metals, especially palladium and platinum from spent catalysts.

Session IV: Raw materials processing

We can unlock unexploited EU metal resources thanks to new processing technologies, which are material- and cost-efficient. These sources of raw materials were mostly unexplored in the past, due to their complex composition, or low concentration. Novel processing strategies make it feasible to access the raw materials present in domestic (EU) by-products, despite their complex composition.

SCALE (Production of Scandium compounds and Scandium Aluminum alloys from European metallurgical by-products) – has developed flowsheets to obtain scandium metal and scandium-aluminium alloys starting from bauxite residue and from titania acid waste (European industrial residues). These processes are being demonstrated at pilot scale. **CHROMIC** (efficient mineral processing and Hydrometallurgical Recovery of by-product Metals from low-grade metal containing secondary raw materials) – has developed an innovative flowsheet to increase the supply of metals like chromium from European resources (slags). The project has demonstrated 95% chromium removal from slags, with the potential to recover 700 kton/year chromium.

METGROW+ (Metal Recovery from Low Grade Ores and Wastes Plus) - targets metallurgical technologies to valorise EU's low-grade, polymetallic primary and secondary resources. The presentation highlighted the main validation results. However, the most remarkable outcome of the project might be the METGROW+ toolbox, a flexible metallurgical systems toolbox consisting of a broad range of metallurgical unit operations. Its purpose is to help in the decision-making process. The tool will be released and available to the wider public by the end of January 2020.

FAME (Flexible and Mobile Economic Processing Technologies) – has developed novel mineral processing solutions to facilitate the commercial exploitation of European skarn, greisen and pegmatite – these ores are relatively abundant in Europe, and contain a number of critical raw materials. Particularly, FAME had remarkable success on lithium production and tin production – both processes were piloted in the frame of the project.

Closing remarks:

A selection of Horizon 2020 research and innovation projects (completed or close to completion) was presented during the event, showing advanced solutions for sustainable exploration, extraction and processing of raw materials. The last call for Horizon 2020 project proposals is open, a last batch of Horizon 2020 projects will be starting in 2021. Horizon 2020 project results constitute the foundation for raw materials projects funded under the new Research & Innovation Framework Programme, Horizon Europe.