



E R A • M I N

NETWORK ON THE INDUSTRIAL HANDLING  
OF RAW MATERIALS FOR EUROPEAN INDUSTRIES

## PROJECT CATALOGUE



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## Foreword

Investments in research and innovation are of crucial importance to European competitiveness and growth. Joint transnational investments can bring forward transnational projects of high quality with a focus on common issues and needs. This is especially true for the European raw materials sector, where geology has no boundaries and all countries are facing similar challenges when it comes to raw materials supply for society and industry.

ERA-MIN, a network on the Industrial handling of raw materials for European industries, supported by the European Commission under the 7th Framework Programme, has produced an extensive roadmap for the field (<http://www.era-min-eu.org/about/era-min-roadmap>) and has launched three joint calls for projects in 2013, 2014 and 2015. The calls have been jointly generated by up to twelve countries. We are very happy that our calls also have aroused interest outside Europe, enabling the participation of international call funding partners.

We are proud to present the projects funded by the national funding agencies under the first (2013) and second (2014) ERA-MIN joint calls.

The projects aim to increase the knowledge base for raw materials and their use and re-use in the industrial and societal area. In this project catalogue you will find details on projects as well as contact details for project leaders. Please take a moment to see what the results can mean for you and your organization, and do not hesitate to contact either the projects or the funding organizations if you would like to know more.

*Margareta Groth*  
Chair of the  
ERA-MIN Board

*Elisabeth Kohler*  
Coordinator of  
ERA-MIN





## Introduction

The EU uses about 20 % of the mineral resources produced globally while its domestic production is limited to 3 % of the world production. The EU is therefore highly dependent on the import of many mineral resources and securing supplies has become crucial. This requires advanced research on the entire value chain from ore extraction to mineral processing, and from product design to reuse and recycling.

ERA-MIN has been an active actor in fostering the European research on the issues related to the three segments of the non-energy mineral resources: construction minerals, industrial minerals and metallic minerals. Besides launching joint calls, ERA-MIN has published a Roadmap for the European research with a 20 years time horizon, which encompasses the entire raw materials value chain as well as the potential of substitution and cross-cutting issues like the mitigation of environmental impacts and raising public awareness. The preparation of the roadmap involved more than hundred experts from the ac-

ademic and industrial sectors, funding agencies and decision makers. With over 1800 downloads from our website in two years, this document can be considered as an important contribution to the identification of the main scientific and technical challenges that should be addressed by future research in its fundamental and applied dimensions. The ERA-MIN Roadmap has been the reference document for the implementation of the three joint calls that we have launched during the last three years.

This project catalogue presents the projects funded under the first and second ERA-MIN joint calls and will be updated with the results of the next call(s).

*Olivier Vidal*

Scientific coordinator of  
ERA-MIN

## Joint Call 2013: Summary Report

Five ERA-MIN funding agencies, FCT (Portugal), NCBR (Poland), TEKES (Finland), UEFISCDI (Romania) and VINNOVA (Sweden), committed together a total of €3.9 million of national public funds to support their national participants in the selected transnational R&D proposals submitted to the first ERA-MIN Joint Call 2013.

18 full proposals were submitted in total from 67 participants. Out of the 18 proposals, 14 passed the eligibility check. After evaluation and ranking, 4 projects were finally selected for funding: CELMIN, GEOSULF, MAXI, SUSMIN.

The total success rate of the Joint Call 2013 is 22.2 % (4 funded/18 submitted proposals). When considering the 14 eligible proposals the success rate increases to 28.6 %.

The scope of this first Joint Call 2013 was needs-driven research on “sustainable and responsible supply of (non-energy) primary resources” with the following sub-topic areas:

1. Exploration,
2. Extraction,
3. Mine closure and rehabilitation,
4. Minerals processing,
5. Metallurgy.

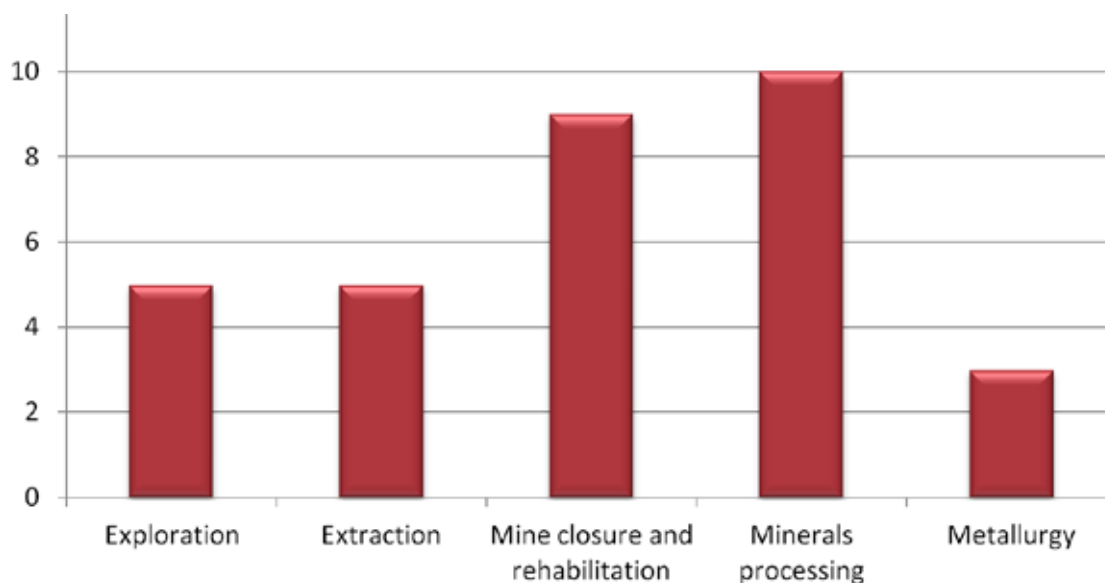


Fig. 1. Distribution of the 18 submitted proposals by sub-topic areas in the ERA-MIN Joint Call 2013

Nine proposals targeted more than one topic sub-area and three proposals addressed metallurgy as a second/third topic sub-area, Fig. 1. In terms of country participation, there was an oversubscription rate for all countries when comparing the requested funding with the indicative committed budget, which shows a high interest in research to address material scarcity. As regards the participation per country, the table below shows an overview by roles in the submitted eligible projects, Fig. 2.

Country	Participation as partner	Participation as coordinator
Finland	14	7
Poland	13	2
Portugal	20	2
Romania	11	1
Sweden	9	2
<b>Total</b>	<b>67</b>	<b>14</b>

Fig. 2. Distribution of participants in submitted proposals, by country in the ERA-MIN Joint Call 2013.

In terms of industrial participation, SMEs accounted for 26% of the participants in the selected funded projects of the first ERA-MIN Joint Call 2013, Fig. 3.

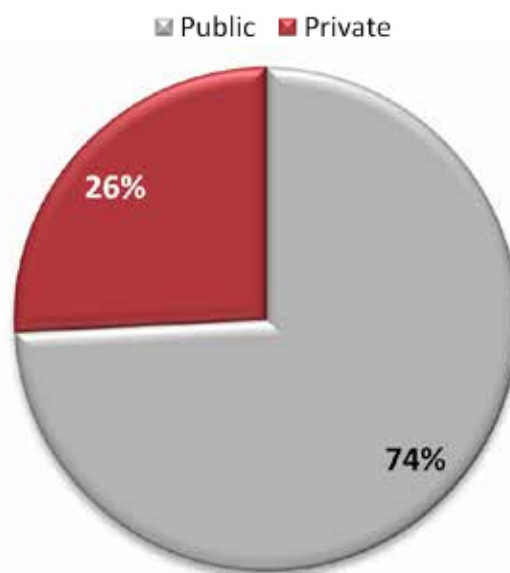


Fig. 3. Categories of participants in submitted projects in the ERA-MIN Joint Call 2013.

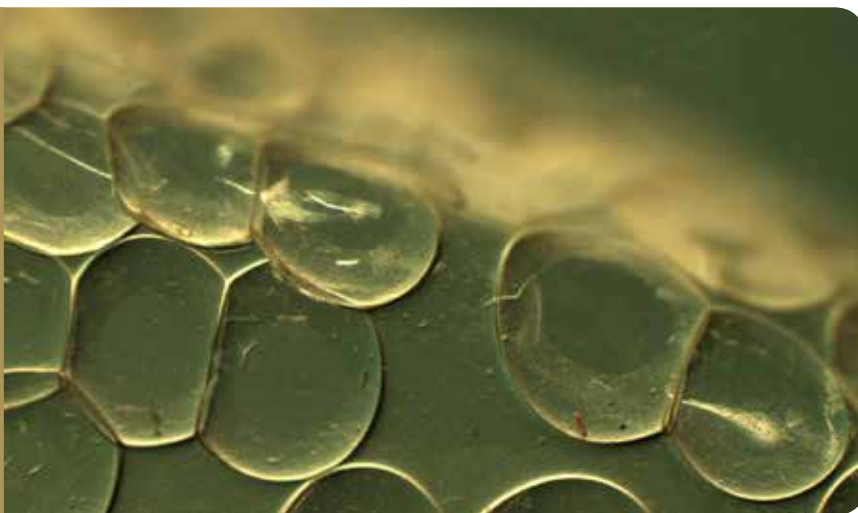
Total costs: €630.687

Funding granted: €329.912

Duration: 3 years (2014–2016)

Project coordinator: Ari Ammala,  
University of Oulu, Finland

E-mail: ar.ammala@oulu.fi



## Project CELMIN — Utilisation of green chemicals in non/energy extractive industries: Preparation of modified nanofibrillar celluloses (NFC) for flotation, flocculation and dewatering, and water purification in mining industry

### SUB-TOPICS AREAS

Extraction, Mine closure and rehabilitation, Minerals processing

### SUMMARY

Although the majority of dissolved solid substances in waters originates from ore, a small amount of pollutants comes from oil-based chemicals used in flotation as well as other metal concentration processes and dewatering, possibly creating toxicity problems when released in effluents. Thus, the purification of waters coming from both extraction and mineral processing during mining activities is needed. Mineclosure and rehabilitation issues have to be taken into account because acid drainages are also generated at abandoned mine sites. The CELMIN project aims to develop concepts for environmental-friendly effective green chemicals by the chemical modification of nanofibrillar celluloses (NFCs) to be functional in mining applications responsible for dissolved and suspended solids load.

Four different uses are studied:

1. Use of hydrophobized NFCs as a collector in ore and mineral flotation.

2. Use of anionized, cationized and hydrophobized NFCs as a dewatering agent in concentrate and tailings.
3. Use of anionized and cationized NFCs as a flocculant in suspended solids removal from mining, process and seepage waters.
4. Use of anionized NFCs as adsorbent in removal of heavy metals and ammonium from waters.

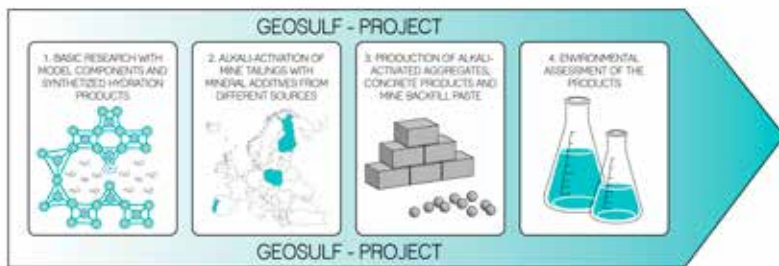
The results of the CELMIN project are expected to increase sustainability of primary non-energy resource supply by decreasing water pollution of mining industry, lower carbon footprint by using renewable raw materials instead of a fossil feedstock in chemical production and lessen the concern about environmental issues by using biodegradable chemicals in dressing of ores and water purification.



### PARTNERS

1. University of Oulu (Finland) - Coordinator
2. IST LISBON (Portugal)
3. NUCBM (Romania)
4. Sibelco Lda (Portugal)
5. Sojitz Beralt Tin & Wolfram S.A (Portugal)





Total costs: €929.423

Funding granted: €605.536

Duration: 3 years (2014–2017)

Project coordinator: Jouko Niinimäki, University of Oulu, Finland

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jouko.niinimaki@oulu.fi

## GEOSULF – Utilization of sulphide mine tailings in geopolymer materials

### SUB-TOPICS AREAS

Mine closure and rehabilitation, Minerals processing

### SUMMARY

The GEOSULF project aims to sustainable utilization of sulphide mine tailings in geopolymer materials. Three Universities from Finland, Poland and Portugal will develop geopolymerization recipes, geopolymer aggregates and concrete products utilizing sulphide mine tailings provided by Finnish and Polish gold and copper mines. In geopolymerization, alumina and silica rich materials are activated with alkali solution. The formed geopolymer is a three-dimensional amorphous network that can immobilize hazardous components into its structure. The project aims at deep understanding on geopolymerization of mine tailings into a form in which harmful substances cannot dissolve. The project involves four RTD parts:

Understanding of geopolymerization by model sulphide and heavy metal components;

Development of geopolymer recipes and aggregates from mine tailings;

Development of novel geopolymer based products like mine backfills and concrete bricks;

Environmental assessment of products developed.

The project results in new treatment technologies, mining practices and novel products. Development of new methods and products will provide new business opportunities for companies and more jobs in EU and promote exportation business possibilities from EU to other countries. To roll out research results across all EU member states will promote generation of new European researcher network in the area of mine tailings utilization.



### PARTNERS

1. University of Oulu (Finland) - Coordinator
2. University of Aveiro (Portugal)
3. AGH University of Science and Technology (Poland)

Total costs: €1.050.000

Funding granted: €482.334

Duration: 3 years (2014–2017)

Project coordinator: Mauri Aikio,  
Teknologian tutkimuskeskus  
VTT, Finland

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## MAXI – Mineral Analysis using X-ray Imaging

### SUB-TOPIC AREAS

Minerals processing

#### SUMMARY:

The main objective of the research is to improve material analysis efficiency, both in terms of material recognition accuracy and speed of detection. XRF spectroscopy is widely used in production plants and exploration of mining companies, both as handheld instruments and in conveyor belt analysis subsystems. However, current industrial XRF systems have poor spatial resolution: they typically are unable to localize particles with dimensions below 100 mm.

The goal of the project is to improve the selectivity at least with one order of magnitude, down to about 10mm spatial resolution.

Another shortage of current industrial XRF systems is the fact that they only analyse the surface of the sample, ignoring most of the volume. This gives an erroneous estimate of the element concentration, especially for elements with uneven distribution, such as precious metals. The goal here is to read XRF-signals from the whole sample volume by using high energy X-ray generators and detector arrays.

### PARTNERS

1. Teknologian tutkimuskeskus VTT (Finland) - Coordinator
2. Orexplore AB (Sweden)
3. Advacam Oy (Finland)
4. Geological Institute of Romania (Romania)



Total costs: €1.937.000

Funding granted: €1.236.602

Duration: 3 years (2014–2017)

Project coordinator: Soile Backnäs, Geological Survey of Finland, GTK

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## Project SUSMIN — Tools for sustainable gold mining in EU

### SUB-TOPIC AREAS

Mineral processing

### ABSTRACT

Gold mining is a chance for Europe to increase economic development, but its challenge is eco-efficiency due to low grade of gold in the ore, its extraction methods (e.g. cyanide) and association often with arsenopyrite. Due to its high mobility and toxicity, arsenic is problematic in mine wastes and waters, but it also complicates the recovery of gold. Social licence for gold mining is often more challenging by respect to other mineral resources. Thus, economically viable gold mining is also dependent on environmental and social sustainability. The objective of the project is to support environmentally, socially and economically sustainable gold production within EU to decrease import dependency. The project identifies, tests and improves technological solutions for gold exploration, mineral processing, water treatment, waste management and environmental impact assessment. In addition, project aims to develop tools for enhancing corporate social responsibility, social accept-

ance and designing postmining development. Research and development measures will be carried out cooperatively between partners and industrial companies in case studies at participating countries. The project provides new sustainable technologies for exploration, selective gold recovery with decreased environmental impacts, alternative reagents for cyanide, advanced adsorbents for water treatment and methods for sustainable waste management such as paste technology. With the environmental risk assessment and better knowledge of geochemistry and long-term transformation of the contaminants in wastes and mine waters, the mining companies are able to predict and prevent the impacts to the surrounding environment. Results will be combined to reports and recommendations for mine industry and will be useful for the industrial partners and have national and transnational impact.

### PARTNERS

1. Geological Survey of Finland, GTK (Finland) - Coordinator
2. Luleå University of Technology (Sweden)
3. Geological Institute of Romania (Romania)
4. Wrocław University of Technology (Poland)
5. Babes-Bolyai University (Romania)
6. Trinity College Dublin, School of Chemistry (Ireland)
7. University of Porto (Portugal)

## Joint Call 2014: Summary Report

A total of 13 research funding agencies from 11 countries committed together a total of €7.7 million to the second ERA-MIN Joint Call: ADEME (France), ANR (France), DST (South Africa), FCT (Portugal), MINCYT (Argentina), MINECO (Spain), NCBR (Poland), OTKA (Hungary), SGU (Sweden), TEKES (Finland), TUBITAK (Turkey), UEFISCDI (Romania) and VINNOVA (Sweden).

21 full proposals were submitted in total from 83 participants. Out of the 21 proposals, 16 were declared eligible. The eligible proposals were passed on to 26 independent external evaluators, coming from 14 countries. 7 high quality proposals were selected for transnational funding:

AMDREY, BOFLUX, ENVIREE, EXTRAVAN, NewOres, RAREASH, StartGeoDelineation.

The total success rate of the Joint Call 2014 is 33.3 % (7 funded/21 submitted proposals). When considering the 16 eligible proposals the success rate increases to 43.75 %, which means that it nearly doubled that of the previous Joint Call.

The second ERA-MIN Joint Call (2014) addressed all aspects of the non-energy raw materials value chain, grouped into three main topic areas:

1. Primary resources;
2. Secondary resources (recycling);
3. Substitution of critical materials

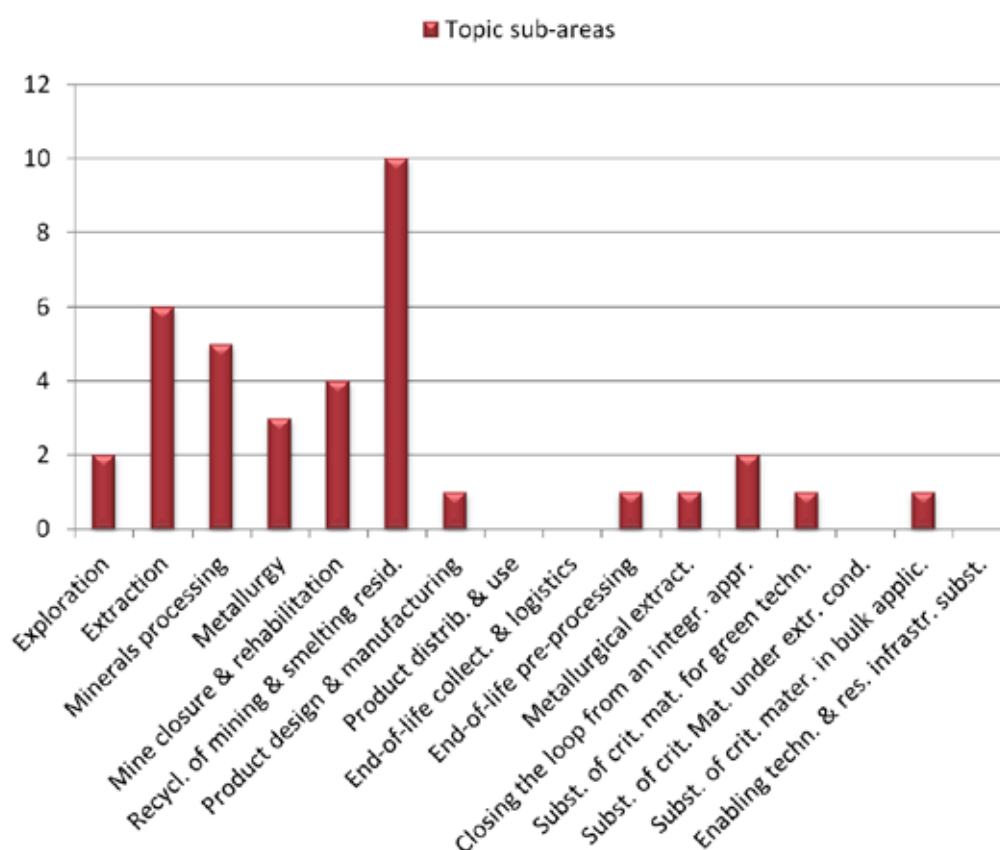


Fig. 1. ERA-MIN subtopic areas addressed by the 16 submitted eligible proposals.



The funded proposals (as well as the majority of the other proposals) addressed primarily topics connected to extraction, processing, and metallurgy and recycling of mining waste, as shown in Fig. 2.

In terms of country participation, there was an oversubscription rate for VINNOVA-Sweden, UEFISCDI-Romania, NCBR-Poland and DST-South Africa when comparing the requested funding for the selected projects with the indicative committed budget.

Apart from applicants coming from the countries participating in the Joint Call, there were also

four other applicants coming from other countries not taking part in the Call (Norway, Germany, Italy), joining ERA-MIN consortia with own funding from their proposed activities. The table below shows an overview in terms of roles (partner/coordinator) taken by the applicants, by country, Fig. 2.

In terms of industrial participation, SMES accounted for 22 % of the participants in the submitted projects of the ERA-MIN Joint Call 2014, Fig. 3.

Country	Participation as partner	Participation as coordinator
Finland	6	0
France	8	4
Hungary	0	0
Poland	12	0
Portugal	18	4
Romania	16	3
Spain	8	8
Sweden	9	3
Turkey	0	0
South Africa	4	1
Argentina	2	0
<b>Total</b>	<b>83</b>	<b>16</b>

Fig. 2. Country origin of the applicants in the ERA-MIN Joint Call 2014.

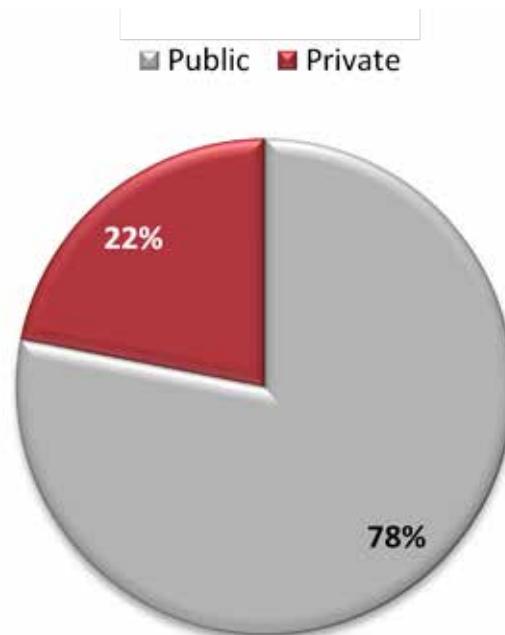


Fig. 3. Categories of participants in submitted projects in the ERA-MIN Joint Call 2014.

Total costs: €972.500

Funding granted: €830.140

Duration: 2 years (2015–2016)

Project coordinator: Carlos  
AYORA, Agencia Estatal Consejo  
Superior de Investigaciones  
Científicas, Spain

E-mail: caigeo@idaea.csic.es



## Project AMDREY – Extraction of Earth Elements from Acid Mine Drainage

### SUB-TOPIC AREAS

Recycling of mining and smelting residues (incl. historical dumps and tailings)

### SUMMARY

Rare Earth Elements and Yttrium (REY) are Critical Raw Materials (CRM) which are essential for modern technologies. They are conventionally mined from igneous rocks, and they are now a priority exploration target worldwide. The ultimate objective of the proposal is the extraction of REY from the treatment of Acid Mine Water (AMD). This is an unwanted pollution that is expected to flow out from coal and sulphide mines for hundreds of years. AMD hosts REY concentrations much higher than those in continental waters and oceans. AMD treatment systems produce low crystallinity iron and aluminium hydroxides. Preliminary surveys have shown that these solids retain practically all REY dissolved in AMD. Therefore, the outputs may provide a new and almost inexhaustible natural source of REY that is sustainable and beneficial to the environment. The objective of the proposal is to test the feasibility and the optimum conditions to recover REY from AMD. Two methods of AMD neutralisation and precipitation of REY

are proposed: the addition of controlled doses of alkaline reagents for high flow rate discharges; and the passive infiltration through a limestone filter. Both procedures aim to obtain a sequence of precipitates where REY can be obtained selectively. The systems will be tested at laboratory and field scale in the Spain and in South Africa. These hydrated precipitates are then dried and concentrated into oxides ready to be transported for extraction. Finally, REY concentrate with high purity will be obtained by a multi-step extraction process consisting of leaching and chemical separation. From these solutions, advanced REY materials could be obtained (coordination polymers, self-assembled lanthanide-organic frameworks) showing interesting application (catalyst, photonic or magnetic properties). Also a novel method based on a recently developed recyclable porous material, called CH Collector, will be tested to directly collect REY from AMD without any precipitation step.

### PARTNERS

1. Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain) - Coordinator
2. Institut de Chimie Séparative de Marcoule (France)
3. University of the Free State (South Africa)
4. Universidad de Huelva (Spain)
5. Oy Chemec Ab (Finland)



Total costs: €269.500

Funding granted: €221.925

Duration: 18 months (2015–2016)

Project coordinator:  
Isabel Geldenhuys, Mintek,  
South Africa

E-mail: [isabelg@mintek.co.za](mailto:isabelg@mintek.co.za)

## Project BOFLUX – Characterisation of the impact, boron addition has on the physical and smelting properties of chromite slag

### SUB-TOPICS AREAS

Metallurgy

### SUMMARY

The slag liquidus temperature in most pyrometallurgical processes is controlled by the addition of fluxes such as silica, lime and dolomite. High-melting point materials, like chromite ores (the only commercial source of chromium metal), in particular utilises the flux principle. Boron containing fluxes are widely used for glass production since they lower the melting temperature of silica by a significant extent. The purpose of this study is to evaluate the potential use of boron containing minerals in chromite smelting process to achieve improved energy and operating efficiencies.

### PARTNERS

1. Mintek (South Africa) - Coordinator
2. Ab Etiprodukt Oy (Finland)
3. Siyanda Chrome Smelting Company Pty Ltd (South Africa)

Total costs: €2.481.175

Funding granted: €1.822.371

Duration: 3 years (2015–2017)

Project coordinator: Christian Ekberg, Chalmers University of Technology, Sweden

E-mail: che@chalmers.se



## Project ENVIREE — ENVironmentally friendly and efficient methods for extraction of Rare Earth Elements from secondary sources

### SUB-TOPICS AREAS

Extraction, Minerals processing, Mine closure and rehabilitation, Recycling of mining and smelting residues (incl. historical dumps and tailings)

### SUMMARY

The ENVIREE project develops processes making it possible to extract REE from different types of secondary sources currently handled as waste. The developed leaching processes will be more environmentally friendly than the current ones, thus making REE extraction possible in Europe again. Various waste materials (mostly tailings from other metals mining and processing) will be investigated with respect to their REE potential. Optimized leaching processes will be developed. Plant uptake for both recovery

of sites and enrichment of REE at the same time (biosorption and bio-precipitation) will be studied. Life cycle analysis will be performed to guide the selection of optimal processes and land reclamation. This will be combined with remediation studies and suggestions for the different selected sites. We will also put a significant effort in education and training of young scientists and students in the relevant scientific fields.

### PARTNERS

1. Chalmers University of Technology (Sweden) - Coordinator
2. AGH/AGH UST University of Science and Technology/Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie (Poland)
3. Alexandru Ioan Cuza University (Romania)
4. Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (Portugal)
5. Karlsruher Institut für Technologie (KIT) (Germany)
6. Primus.inter.pares AS (Norway)
7. Commissariat A L Energie Atomique et Aux Energies Alternatives (France)
8. EDM - Empresa de Desenvolvimento Mineiro, S.A. (Portugal)
9. Council for Geoscience (South Africa)
10. Savona Project SP. Z O.O. (Poland)
11. Bureau de Recherches Géologiques et Minières (France)





Total costs: €1.203.234

Funding granted: €829.912

Duration: 2 years (2015–2016)

Project coordinator: Guozhu Ye,  
Swerea MEFOS, Sweden

E-mail: guozhu.ye@swerea.se

## Project EXTRAVAN — Innovative extraction and management of vanadium from high vanadium iron concentrate and steel slags

### SUB-TOPIC AREAS

Extraction, Minerals processing, Metallurgy, Recycling of mining and smelting residues (incl. historical dumps and tailings), Metallurgical extraction

### SUMMARY

Vanadium is an economically important metal for EU whose industry consumes about 13 % of the global vanadium production. Vanadium is mainly used for production of high strength and special steels, and advanced alloys for aerospace application. The vanadium production in EU is highly dependent on import of the raw materials. At the same time there are large amount of unexploited vanadium sources in EU member states. There are several titaniferrous ore deposits with around 1% V and large amount of steelmaking slag (BOF-slag) with up to 3 % V. This consor-

tium (partners + subcontractors) consisting of three world leading research institutes (Swerea MEFOS/BRGM/GTK) in the fields of mineral processing, process metallurgy and environmental technology, a world recognised research group at KTH and a mining and metallurgical company Mustavaaran Kaivos Oy (owner of a Vrich titaniferrous ore deposit in Finland). This project seeks to develop breakthrough technologies which will enable economic and environmental friendly exploitation of these unused vanadium sources in Europe.

### PARTNERS

1. Swerea MEFOS (Sweden) - Coordinator
2. Mustavaaran Kaivos Oy (Finland)
3. Bureau de Recherches Géologiques et Minières (France)

Total costs: €1.818.244

Funding granted: €451.344

Duration: 3 years (2015–2017)

Project coordinator: Michel Cathelineau, Université de Lorraine, France

E-mail:  
laurie.wolff@univ-lorraine.fr



## Project NewOres — Development of New models for the genesis of Rare Metal (W, Nb, Ta, Li) Ore deposits from the European Variscan Belt and valorization of low grade and fine grained ore and mine tailings

### SUB-TOPIC AREAS

Exploration, Extraction, Minerals processing, Metallurgy

### SUMMARY

NewOres is a project devoted to the: i) development of new models of ore deposition relevant for the W-Sn (Nb-Ta-Li) mineralisations, and intend to propose of new exploration guides for this type of mineralization, by building a fully comprehensive model for the behaviour of metals during crustal magmatic events, and ii) by understanding the behaviour of these metals at the hydrothermal stage, thanks in particular to by refinement of the in-situ analysis of trace elements especially Nb and Ta in oxides ( $\text{SnO}_2$ ,

$\text{FeWO}_4$ ) and in fluid trapped as fluid inclusions, and by building a new thermodynamic database for Nb and Ta species. iii) Finally, a major goal is the development of new flow sheets for the processing of low grade and fine-grained ores and tailings, in particular from a major W mine (Panasqueira) from already mined deposits thanks to new intensive flotation devices, the combination with centrifugal gravity separation, and search to develop a new energy saving mineral processing.

### PARTNERS

1. Université de Lorraine (France) - Coordinator
2. Sojitz Beralto Tin & Wolfram S.A. (Portugal)
3. Fundação Faculdade de Ciências, Universidade de Lisboa (Portugal)
4. Faculdade de ciencias da Universidade do Porto -FCUP (Portugal)
5. Université d'Orléans (France)
6. Laboratório Nacional de Energia e Geologia-LNEG Lisboa (Portugal)



Total costs: €1.093.249

Funding granted: €1.068.259

Duration: 3 years (2015–2017)

Project coordinator: Georgeta Predeanu, UPB, Romania

E-mail: gpredeanu@gmail.com

## Project RAREASH — Assessment of Possible Recycling Directions of Heavy & Rare Metals Discovered from Combustion Waste Products

### SUB-TOPIC AREAS

Recycling of mining and smelting residues (incl. historical dumps and tailings), Substitution of critical materials for green energy technologies

### SUMMARY

Heavy and Rare Metals-HRM consisting of Lanthanides are important strategic materials for ensuring the security and defensive capacity of states, providing economic development and forming a basis for advanced materials and technologies, particularly electronics. Majority are mined and extracted from primary ore in highly energy intensive processes. Concentrations of these elements are localized in limited areas, and countries and companies, whose manufacturing or technology base depends on imported metals are beginning to look for alternative sources. The project aims to demonstrate by a detailed fundamental and applied investigation the technically feasible alternative for critical metals recovery by recycling combustion waste products (CWP) - fresh and reuse landfilled fly ash and bottom ash - as a source soft (pulverized) rock.

The HRM concentrations in non-energy CWP are available in great amounts due to its original concentration in coal forming basins and to large volumes of coal burnt generating huge amounts of mineral phases, organic matter free that host HRM, among other elements. The proposed approach with a very limited experience in EU and even worldwide will create the possibility for a fast and low-cost access to critical materials and of EU saving natural mineral resources by use of unconventional secondary resources. RareAsh is focused to comply with EU priorities by proposed actions which are innovative (by using recovery methods based on acids and not on cyanides for the advanced recycling of ashes) and have a demonstrative character at laboratory scale.

### PARTNERS

1. Research Centre for Environmental Protection and Eco-Friendly Technologies (CPMTE) from University Politehnica Bucharest (UPB) (Romania) - Coordinator
2. Constantin Brancusi University of Targu Jiu (Romania)
3. Faculdade de Ciências da Universidade do Porto (Portugal)
4. Główny Instytut Górnictwa (Central Mining Institute) (Poland)
5. LIPOR (Portugal)
6. Complexul Energetic Oltenia S.A. (Romania)
7. Przedsiębiorstwo Produkcyjno Handlowe "ADW" Sp. z o.o. (Poland)

Total costs: €926.798

Funding granted: €451.300

Duration: 3 years (2015–2017)

Project coordinator: Alireza Malehmir, Uppsala University, Sweden

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alireza.malehmir@geo.uu.se



## Project StartGeoDelineation — State-of-the-art geophysical and geological methods for delineation of mineral deposits and their associated structures – Sweden and Finland

### SUB-TOPIC AREAS

Exploration, Extraction

### SUMMARY

Through this project Uppsala University, Nordic Iron Ore, and Yara in collaboration with researchers from the Geological Survey of Finland will expand their research profiles and expertise regarding exploration (mainly) for raw materials and mine planning (partly) in their respective countries. Along with the associated knowledge transfer, this is a first step towards preparing the partners for further collaborations and allowing technological and methodological developments that can be exported or demonstrated to other countries in Europe and even beyond. The pro-

ject focuses on three important aspects of exploration namely geophysical, geological and petrophysical studies along with the development of tools and methods for a better delineation and characterisation of mineral deposits and their host rock structures through basic mapping, petro-mineralogical studies, deep imaging and targeting, 3D/4D geophysical and geological modelling at two sites in Sweden and Finland where active exploration or mining is currently ongoing.

### PARTNERS

1. Uppsala University (Sweden) - Coordinator
2. Nordic Iron Ore (Sweden)
3. Yara (Finland)











Bundesministerium  
für Bildung  
und Forschung



**FCT**

Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA



**Materials  
innovation  
institute**



Centro para el Desarrollo  
Tecnológico Industrial



**SGU**

Sveriges geologiska undersökning  
Geological Survey of Sweden

*UEFISCDI*  
Executive Agency for Higher Education,  
Research, Development and Innovation Funding

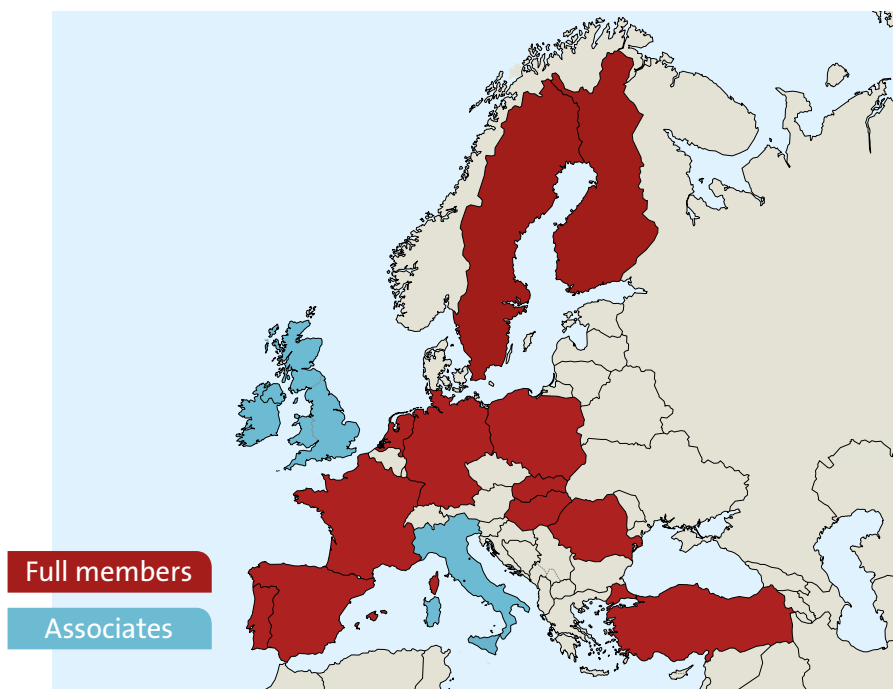


**Presidencia  
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