Horizon 2020 Programme

MSP-REFRAM

Coordination and Support Actions (Coordinating) (CSA-CA)

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6 months project report

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Multi-Stakeholder Platform for a Secure Supply of Refractory Metals in Europe
EC Scientific Officer: Stéphane Bourg (CEA)

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Summary

6 months project report

Approval

Date	By
2016-08-04 09:23:35	Mr. BOURG STéPHANE (CEA)
2016-08-04 09:23:45	Mr. BOURG STéPHANE (CEA)

CONTENT

WP 1 – MULTI-STAKEHOLDER PLATFORM

WP	1	WP Leader	AMPHOS 21
Manpower expected	37 person/month	Man	

Contribution to Deliverables (number and title of each deliverable)

Contribution to D6.2 Report on knowledge identification and measurement led by IDENER. Achieved on March 1st, 2016.

Contribution to Milestones (number and title of each milestone)

M111 Identification of the knowledge required for the construction of the multi stakeholder platform. Approval of delivery of D621 on March 1st, 2016.

Main achievements - Progress

The multi-stakeholder platform was launched involving key stakeholders of the refractory metals value chain through the initial State of the Art workshop, which was held on May 30th- 31st, 2016 in Barcelona (task 1.5). Information regarding primary and secondary resources fed by deliverables of WP2, WP3 and WP4 and current needs of the EU industry for each of the metals (WP1) was presented and discussed.

Deliverable D151 First workshop (State of the art) will include the participants, agenda, speakers and presentations and main discussions and conclusions drawn from the workshop.

With regards to task 1.1., figures about current needs of the EU industry for each of the metals and main applications were collected and data gaps, particularly related with EU market share and industrial value chains, were identified. Main results, a list of questions for external experts and alternatives for addressing data gaps e.g. experts' services, were presented during the 1st workshop as well.

Main difficulties - Delays

Most of the collected figures (public data) on different uses per metal were based on the world scale but not at the EU level, some gaps on EU consumption for each use/application for each metal were identified.

As international trade has shown not to be adequate to determine the actual needs, the need for market expert analyses has been identified. Some experts have been contacted and some offers obtained which were also presented during the workshop for partner's consideration.

Scientific publications, patents (beneficiary name and type of publication)

Journal:
Int. Conference Oral:
Int. Conference Poster:
Proceedings:
Patent:

Effective collaboration between Beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
CEA		X	X				X														
AMPHOS21	X		X	X			X	X	X	X		X				X			X	X	X
BRGM		X																			
CARTIF		X																			
CHALMERS																					
E-MINES																					

ERAMET		**X**																			
GTK																					
ICCRAM		**X**																			
IDENER		**X**																			
IMN																					
ADE		**X**																			
UNIKL																					
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MEFOS		**X**																			
NTUA																					
TU DELFT																					
VTT		**X**																			
LGI		**X**																			
PROMETIA		**X**																			

INTRODUCTION

WP1 is structured by a series of three workshops where the various phases of the proposed work are developed through stakeholder engagement. WP1 is fed by the 4 technical WP's (WP2, WP3, WP4 and WP5) in terms of data collected and innovation proposed:

- WS1: The state of the art in primary and secondary resources; current production and usage and the entire value chain
- WS2: Presentation and discussion of innovative pathways: substitutions, product design and value chain
- WS3: Feasibility of proposed innovations and adequacy of current standards and obligations

Managed by the Consortium, WP1 has gathered experts from the three groups (Policy/Society; Technology, Market), as defined by the External Experts Committees (EEC).

WP1 aims to assessing the current and future selected metal needs of European industry. It also examines to what extent these can be met from European and non-European sources, and explores innovative strategies for improving reliability and affordability of supply for metals and metal-based intermediate products. It will deliver guidelines, define indicators and potentially propose (new) standards. This will be used to analyse the data collected and the innovation proposed in the four technical WPs.

MAIN RESULTS

TASK 1.1 CURRENT AND FUTURE SELECTED METAL NEEDS OF EUROPEAN INDUSTRY

MANPOWER

4 person.month

MAIN PROGRESSES

Only the current needs have been identified in this first part of the project. The different applications of each metal have been well documented. The future needs will be addressed until October.

DIFFICULTIES

Most of the market shares of each metal are given for the world, but the precise EU market share is usually lacking in the open literature. We need to ask for further expertise from external experts (business consultants or producers associations). A list of detailed questions has been set up.

ACTION PLAN

A commercial expertise has been ordered to Roskill in July; it is related to tantalum market, as a first example, and is expected by the end of August.

TASK 1.2 PRESENT DESIGN AND LOOPS OF THE SELECTED METALS EU INDUSTRIAL VALUE CHAINS

MANPOWER

8 person/month

MAIN PROGRESSES

Applications of several metals were identified, with especially products used for each of these applications. First figures of EU consumption of these metals were obtained for most of metals. Situation of each metal in the EU chain value is established, but could be more detailed in a further work.

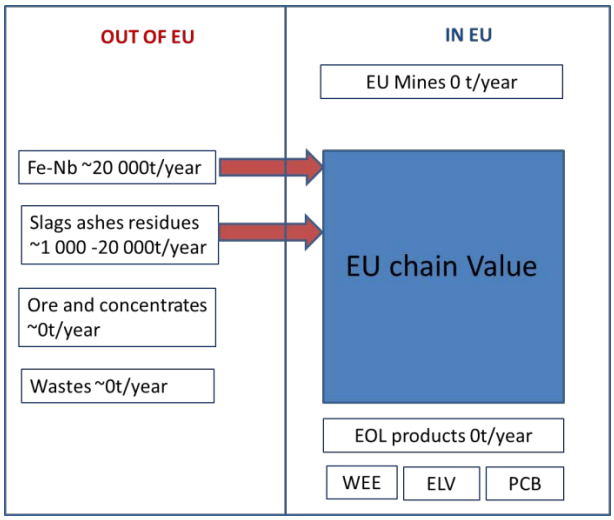
DIFFICULTIES

Some data are quite difficult to access:

- especially metal contained in wastes and in residues
- the rate of recycling of these metals in each of their own industries
- The consumption data for each application in the EU chain

ACTION PLAN

- Establish a graphical "Mass flow balance of EU " for each metal in order to have a visual synthesis of the situation in the EU chain value: Here is an example of Niobium for tonnages:



- Identify each for each application actors and their consumption in order to detail the EU chain value by groups → Questions to experts to access datas

Have a better sight on future applications of each metal → Questions to experts

TASK 1.3 EU RESERVE VS. EU DEMAND: THE SUPPLY CHAIN

MANPOWER

7 person.month

MAIN PROGRESSES

Experts were contacted to address the question of data gaps concerning updated supply and demand figures for the refractory metals at the European level. A partnership will be developed with consultants to reach the appropriate level of knowledge. In addition, data on recycling flows collected from other WP and tasks, especially 3.1 And 4.1 (Mappings of industrial wastes and end-of-life products) will be integrated in the assessment, as well as input coming from Task 1.2. Both will help answering the question of EU Reserve vs. EU Demand. Work is still to be done and distributed between partners by individual actions to produce the deliverable for month 9.

DIFFICULTIES

As mentioned earlier, the major difficulty identified was at the level of collecting data, either because most of the collected figures per metal were based on the world scale or because it was not recent enough to be relevant. This difficulty will be solved thanks to the help of external experts and/or contacts with the main industrial actors through producers associations.

ACTION PLAN

Each partner will have an action on a particular metal. The final report is due for month 9.
Maybe it will be necessary to take an associate membership in one or another producers associations (IMOA, TIC, MMTA), which could be an opportunity to try and obtain the production of some industrial actors with a reduced annual fee.

TASK 1.4 RE-DESIGNING THE FUTURE: DESIGN OF FUTURE INDUSTRIAL VALUES CHAINS FOR REFRACTORY METALS

MANPOWER

9.5 person/month

MAIN PROGRESSES

Identification of the current value chains for the 5 refractory metals, first discussion with the partners in charge of each refractory metal. First contact with different actors of the value chain and companies involved.

DIFFICULTIES

They are expected because, if some future applications of refractory metals are already known, the market development is difficult to predict and depends on prices, demand and appearance of surrogates.

ACTION PLAN

A questionnaire will be prepared and distributed to the different actors of the value chain, companies related with the refractory metal industry and key associations such as National Association of Manufactures of Capital Goods (Sercobe) in Spain. The information obtained will be applied for the re-design of the value chain and the analysis of the different barriers identified.

TASK 1.5 COORDINATION OF THE MSP (ESTABLISHMENT OF THE EXPERTS COMMITTEES, ANIMATION OF THE WORKING GROUPS)

MANPOWER

8 person/month

MAIN PROGRESSES

During the initial State of the Art workshop (WS1) gathered information regarding primary resources (WP2) and secondary resources, industrial waste and tailings (WP3) and urban mining (WP4) was presented per metal. The workshop involved all key stakeholders of the refractory metals value chain, who contributed with additional information, references and discussion.
In addition, the current production and usage of refractory metals in Europe was presented, main gaps identified and recommendations made on how to address such information gaps.

DIFFICULTIES

Some overlappings between presentations for each metal were identified, particularly on primary and secondary resources.
Data gaps on current metal needs of the EU industry for each use/appliaction were identified.

ACTION PLAN

A second Workshop will be organised September 27-29th (Brussels) where potential innovative pathways will be discussed in order to optimise the balance between resource availability and usage. The aim is to discuss potential substitutions, and assess innovative product/service design and innovative business models that may bring changes in the current value chain. An approach focused on the industrial supply chain will be considered to avoid overlaps.
In addition, members of the three External Experts Committees (EEC) will be defined and questions concerning policy, market and technology will be prepared to be presented during the second and third workshops.
A 3rd workshop will be organised November 29-30th where the feasibility of the proposed innovations will be discussed (policy/society and market aspects), and contrasted with the current situation. The adequacy of current standards and regulations, as well as the potential need for new ones, will be analysed.

PUPLICATIONS

There are no open publications during the project, but all the presentations during the 1st workshop and the deliverables are gathered in the Electronic Content Collaboration Platform (ECCP) managed by LGI: http://app.lgi-consulting.org/ecm/msprefram.

CONCLUSIONS

The multi-stakeholder platform was launched involving key stakeholders of the refractory metals value chain through the initial State of the Art workshop, which was held on May 30th- 31st, 2016 in Barcelona and where deliverables submitted by WP2, WP3 and WP4 were presented and discussed.
Figures about current needs of the EU industry for each of the metals and main applications were collected from public data and data gaps, particularly related with EU market share were identified.
Main results, a list of questions for external experts and alternatives for addressing data gaps e.g. experts' services, were also presented during the 1st workshop.

WP 2 – PRIMARY RESOURCES

WP	2	WP Leader	GTK
Manpower expected	14.5 person month	Man	

Contribution to Deliverables (number and title of each deliverable)

Two reports are delivered :

1. Note to the map of refractory metal deposits in Europe. achieved in April 2016
2. State of the art on the recovery of refractory metals from primary resources. Achieved in April 2016

Contribution to Milestones (number and title of each milestone)

D2.1 describes the map of refractory metal deposits in Europe achived in April 2016. The procedures include : extraction of relevant data from databases the partners have in charge (ProMine and Minerals4EU for BRGM, FODD for GTK); the extracted datasets (excel files) were fed in the GKR system; and final datasets were then imported in ArcGIS to be displayed on the map with the proper symbology.

D2.2 achieved in April 2016 reports the mining and mines of refractory metals, tungsten, tantalum, molybdenum, niobium and rhenium in Europe and the world, and reviews the technologies of mining, mineral processing and extractive metallurgy (hydrometallurgy and pyrometallurgy) on recovery of refractory metals from primary resources.

Main achievements - Progress

In WP2 two reports were delivered. In the first document the Map of Refractory Metal Deposits in Europe was described and final datasets were displayed on the map with the proper symbology. In the second document the information of mines of refractory metals in Europe and the world including reserves, mineralogy, mining methods and operational status are reported, and the existing technologies of mining, mineral processing and extractive metallurgy (hydrometallurgy and pyrometallurgy) are reviewed for recovery of refractory metals from primary resources.

Main difficulties - Delays

The main obstacles and difficulties in the task 2.1 are the harmonization of data from different sources of heterogenous formats and the tight schedule that the task team had to work straight on efficiently and pragmatically.

For the task 2.2 in Europe there are only some tungsten mines. Lacking mines in Europe on other refratory metals caused some difficulties to find sufficient information on mining technologies.

For the task 2.3 and 2.4 there was no real difficulty associated with this phase of the project, as most processing and extraction technologies used to beneficiate refractory metals are rather standard and well documented.

Scientific publications, patents (beneficiary name and type of publication)

N/A

Effective collaboration between Beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
CEA							X														
AMPHOS21																	X				
BRGM						X		X							X						

CARTIF																					
CHALMERS																					
E-MINES			X					X													
ERAMET	X																				
GTK			X			X								X	X						
ICCRAM																					
IDENER																					
IMN																					
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UNIKL														X							
LUT								X					X								
LGC			X					X													
MEFOS																		X			
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PROMETIA																					

INTRODUCTION

In the WP2 there are 5 tasks. The objective of task 2.1 is to produce a map of primary resources of refractory metals (including, whenever data is available, resource, reserves, mineralogy and chemistry) in Europe. In the tasks 2.2, 2.3, and 2.4 the existing and innovative technologies in mining, mineral processing and extractive metallurgy of refractory metals are described and studied. The objective of task 2.5 is to present the waste management and study the waste management required for the future recovery of metals from mining streams.

MAIN RESULTS

TASK 2.1 MAPPING

The objective of task 2.1 of MSP-REFRAM was to produce a map of primary resources of refractory metals (including, whenever data is available, resource, reserves, mineralogy and chemistry) in Europe.
This mapping of primary resources of five refractory metals in Europe will, in turn, help in:

- identifying the available and innovative mining technologies,
- reviewing the existing technologies of mineral processing and extractive metallurgy,
- investigating the innovative technologies,
- evaluating the wastes, including mineral processing tailings and metallurgical slags, with specific attentions to the waste amount reduction, environmental impacts, recovery of valuable trace elements and potential utilisations as construction materials.

As such, task 2.1 was an upstream step of the project that delivered critical information on primary resources of refractory metals in Europe to other tasks and work packages of the project.

MANPOWER

5.5 person month
Three partners of the MSP-REFRAM consortium are involved in the task 2.1. They are BRGM (G. Bertrand, task leader), e-Mines (M. Bonnemaison, Q. Monge and T. Poitrenaud) and GTK (L.S. Lauri, and X.S. Yang, work package leader).

MAIN PROGRESSES

The schedule of task 2.1 was extremely tight, as the present deliverable was due by month 5 of the project timeline. In order to ensure maximum efficiency, a pragmatic work program was set up in the first days of the project and was adapted during the realization of the task. Its main steps were the followings:
1) BRGM and GTK extracted relevant data from databases they have in charge (ProMine and Minerals4EU for BRGM, FODD for GTK). Relevant data was deposits and/or occurences known as containing at least one of the 5 refractory metals in scope. Database extracts were kept simple (Microsoft Excel files) to facilitate merging and compilation. This was completed before the end of January 2016.
2) the extracted datasets (excel files) were fed in the GKR system by E-MINES, in order to facilitate their compilation with the large quantity of data already in the GKR. Then, the GKR was queried to extract a dataset

of all deposits and occurrences containing refractory metals in Europe. This was completed by the end of April 2016.
3) In the meantime, as the dataset extracted from the GKR was providing little information on resources and reserves, another dataset of deposits containing reported amount of refractory metals was built by BRGM. This was based on data exported from ProMine, completed by additional information from the Minerals4EU and FODD databases. This was completed by the end of April 2016.
4) In the meantime, BRGM prepared a layout for the final map, in ESRI's ArcGIS software. This was done during April 2016.

5) The final datasets were then imported in ArcGIS to be displayed on the map with the proper symbology. In the meantime, the present note was prepared. This allowed editing the final version of deliverable D2.1 by the end of April 2016, accordingly to the timeline of the task.

DIFFICULTIES

The main obstacles and difficulties the task team had to overcome were the following :

- harmonization of data from different sources of heterogenous formats. Data were extracted from 4 databases of different types and format and had to be harmonized on compiled in homogeneous datasets. This has been done by BRGM for the dataset of deposits with reported amounts of refractory metals, and by e-Mines for the dataset of deposits and occurrences with unknown amounts of refractory metals.
- The schedule of the task was tight and the deadline was short, and this from the very beginning of the project. Therefore the task team had to work straight on efficiently and pragmatically. This was achieved thanks to i) the limited number of task partners, ii) a good coordination of the task (including a detailed work programm established at the very beginning of the task), and iii) good communication and relationships between task partners.

ACTION PLAN

This section is not relevant as task 2.1 has finalized deliverable 2.1 within schedule and is finished.

TASK 2.2 MINING

The objectives of the task 2.2 are that the first step to describe the existing mining technologies applied in the mining of refractory metals from primary resources in Europe and the world through literature review and meetings with the mining companies, and the second step to conduct studies on the innovations of mining technology for sustainability.

MANPOWER

0.9 person month
Two partners of the MSP-REFRAM consortium are involved in the task 2.2. They are GTK (Jason Yang, task leader) and AMPHOS21 (David Arcos).

MAIN PROGRESSES

Main progresses in the task 2.2:

1) Ore and mineral deposits of five refractory metals including deposit types, resreves, mineralogy and grade in Europe and the world are described;
2) Mines of five refractory metals in Europe and the world are listed. The information include location, company, mineralogy, reserves and grade, type of ore, mining method, operational status and commodity etc.;
3) Existing mining technologies applied in the major mines in Euprope and the world including open pit and underground mining are reviewed and analyzed.

GTK worked on the metals of tungsten, molybdenum and rhenium, and AMPHOS21 was in charge of niobium and tantalum.

DIFFICULTIES

In Europe there are only some tungsten mines. Lacking mines in Europe on other refratory metals caused some difficulties to find sufficient information on mining technologies.

ACTION PLAN

Jan 2016 to May 2016 the existing mining technology description
June 2016 to September 2016 the innovative studies on mining technology

TASK 2.3 MINERAL PROCESSING

The objectives of the task 2.2 are that the first step to describe the existing technologies of mineral processing applied in the mining of refractory metals from primary resources in Europe and the world through reviewing published articles, information on websites posted by mining companies and professional associations, and the technologies owned by project partners, and the second step to study innovative technologies of mineral processing of the refractory metal ores taking account of the processes being energy saving, environmentally friendly and economic feasible.

MANPOWER

2.4 person month
Four partners of the MSP-REFRAM consortium are involved in the task 2.3. They are LGC (Florent Bourgeois, task leader, working on Ta and Nb), GTK (Jason Yang, on W and Mo), BRGM (Kathy Bru, on W) and LUT (Antti Häkkinen, on Mo).

MAIN PROGRESSES

As expected, the task led to a concise review and analysis of the standard ore dressing technologies used to process the ores that are currently mined throughout the world for extracting the refractory metals of interest to the MSP-REFRAM project. The bibliographic nature of the work, and the allocation of specific metals to individual project partners, did permit task 2.3 to progress without a strong degree of interaction between the partners, except at the time of consolidation of their respective work to produce the progress report that was presented at the MSP-REFRAM progress meeting.

For the 5 metals of interest, project partners investigated and summarised the major processing steps that are used to beneficiate the refractory metal bearing ores. Processes that were identified through bibliographic records were found to be rather standard from a technological standpoint.
The analysis however hinted at a number recurring issues that will become focus points for the following project phase, which include reduced process efficiency through production of unrecoverable fines and ultrafines, water consumption and pollution from reagent use, and waste production and associated environmental impacts.

DIFFICULTIES

There was no real difficulty associated with this phase of the project, as most processing technologies used to beneficiate refractory metals are rather standard and well documented. It is anticipated that challenges will arise during the following phase, which may require access to quantitative information from actual processes, some of them being operated outside Europe only.

ACTION PLAN

Jan 2016 to May 2016 the existing mining technology description
June 2016 to September 2016 the innovative studies on mineral processing technology

TASK 2.4 EXTRACTIVE METALLURGY

MANPOWER

5.7 person month
Seven partners of the MSP-REFRAM consortium are involved in the task 2.4. They are LUT (Tuomo Sainio and Sami Virolainen, task leader, working on Mo and Re hydrometallurgy), CEA (Eugen Andreiadis and Daniel Meyer, on Ta and Nb hydrometallurgy), ERAMET (Quentin Bellier, on Ta and Nb hydrometallurgy; Jean-Marie Lambert, on Ta and Nb pyrometallurgy), UNIKL (Hans-Jörg Bart, on W and Mo hydrometallurgy), IMN (Katarzyna Leszczynska-Sejda and Witold Kurylak, on Re pyrometallurgy), MEFOS (Lena Sundqvist and Guozhu Ye, on W and Mo pyrometallurgy), TUDELFT Yiongxiang Yang, on Mo pyrometallurgy).

MAIN PROGRESSES

In the task the standard hydro and pyro metallurgical technologies industrilly applied for extracting the refactory metals from the concentrates of mineral processing are specifically reviewed and analyzed. The main progresses were presented at the MSP-REFRAM progress meeting.
For the 5 metals of interest, project partners investigated and summarised the major processing steps in the hydro and pyro metallurgies.

DIFFICULTIES

There was no real difficulties in the task associated with this phase, as most processing technologies are rather standard and well documented. It is anticipated that challenges will arise during the following phase for innovation studies, which may require access to quantitative information and the factors on economy and enviroment may be considered.

ACTION PLAN

Jan 2016 to May 2016 the existing mining technology description
June 2016 to September 2016 the innovative studies on mineral processing technology

TASK 2.5 ENVIRONMENTAL FOOTPRINT

The main objectives of the task 2.5 are to present waste management and to state the waste management required for future recovery of refractory metals from mining streams based not only on work conducted in the task 2.2, 2.3 and 2.4 but also from the interaction occurring with the industrial partners in the reference group. The possible environmental risks are addressed.

MANPOWER

Two partners of the MSP-REFRAM consortium are involved in the task 2.5. They are NTUA (Antonis Politis, task leader) and AMPHOS21 (Jordi Bruno).

MAIN PROGRESSES

The tasks only started on M6.

CONCLUSIONS

As expected the objectives in the first stage in WP2 were realized. That is, a map of primary resources of refractory metals (including, whenever data is available, resource, reserves, mineralogy and chemistry) in Europe was produced in the task 2.1. The existing mining, mineral processing, extractive metallurgy (hydro and pyro) technologies industrially applied in the mining, processing and extraction of refractory metals from primary resources in Europe and the world were specifically reviewed in the task 2.2, task 2.3 and task 2.4. The innovation studies will be carried on as the work of the second stage. Meanwhile, the work of the task 2.5 will start.
The difficulties encountered during this phase were analyzed. The main obstacles and difficulties in the task 2.1 are harmonization of data from different sources of heterogenous formats and tight schedule. In the task 2.2 lacking mines in Europe on the refratory metals caused some difficulties to find sufficient information on mining technologies. There were no real difficulties in the task 2.3 and task 2.4 associated with this phase, as most processing technologies are rather standard and well documented.

WP 3 – SECONDARY RESOURCES

WP	3	WP Leader	MEFOS
Manpower expected	25 person/month	Man	

Contribution to Deliverables (number and title of each deliverable)

D311 Mapping the secondary resources in the EU (achieved on March 31st, 2016) ;
D31 State of the art on the recovery of refractory metals from secondary resources (achieved on May 15th, 2016).

Contribution to Milestones (number and title of each milestone)

M321 Delivery of the state of the art in secondary mining, waste processing and extractive metallurgy for D31.

Main achievements - Progress

According to the open information in the literature, the state of the art on the recovery of refractory metals (W, Mo, Nb, Ta and Re) from secondary resources (waste rock/tailing and industrial waste/residuals) were reviewed on the aspects of mapping, secondary mining, waste processing and extractive metallurgy.
Moreover, several case studies for the metallurgical extraction of the refractory metals from secondary resources are also provided.
The obtained information was summarized in D311 and D31, which were distributed among partners; the main results were also presented on the 1st workshop.

Main difficulties - Delays

The mapping shows the main streams where refractory metals from secondary resources can be found. However, due to the complexity and diversify of the waste/residual materials, for some of these materials from secondary resources it is difficult to tell their reserves/deposits, their properties and/or their grades.
There were overlapping information provided by the partners within WP3.

Scientific publications, patents (beneficiary name and type of publication)

N/A.

Effective collaboration between beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
CEA			x		x		x				x		x	x		x		x			
AMPHOS21				x										x			x				
BRGM	x			x	x		x	x		x	x		x	x	x	x		x			
CARTIF		x	x					x		x	x			x	x	x	x				
CHALMERS	x		x				x				x		x	x		x		x			
E-MINES																					
ERAMET	x		x		x						x		x	x		x		x			
GTK			x	x					x	x	x				x	x			x		
ICCRAM								x											x		
IDENER			x	x				x			x				x	x					
IMN	x		x	x	x		x	x		x			x	x	x	x		x			
ADE																					

UNIKL	x		x		x		x				x			x		x		x			
LUT	x	x	x	x	x		x	x		x	x		x		x	x	x	x			
LGC			x	x				x		x	x			x		x					
MEFOS	x		x	X	x		x	x		x	x		x	x	x			x	x		
NTUA		x		x										x							
TU DELFT	x		x		x		x				x		x	x		x					
VTT								x	x							x					
LGI																					
PROMETIA																					

INTRODUCTION

During mining and mineral processing waste rock and tailings generated; during the metallurgical extraction of refractory metals and manufacturing of end-use products industrial wastes/residuals are generated. These waste rock/tailings and industrial wastes/residuals are considered as important secondary resources that containing concerned refractory metals (W, Mo, Nb, Ta and Re).

WP3 aims at identifying the refractory metals that exist in these materials and at exploring the methods for extracting refractory metals from these materials.

WP3 is in parallel with WP2 and WP4, and they together provide a panoramic view for the concerned refractory metals found in the industrial value chains. WP3 is also input for the other work packages.

MAIN RESULTS

TASK 3.1 MAPPING

MANPOWER

2 person/month (execute as planned)

MAIN PROGRESSES

The secondary resources are mainly identified as the streams of waste rock/tailing and industrial wastes/residuals, a list of secondary resource materials that containing concerned refractory metals are listed in the aspects of their sources, their reserves/deposits, their properties and their grades, etc.

DIFFICULTIES

For some of the waste/residual materials it is difficult to tell their reserves/deposits, their properties and/or their grades according to the open information.

TASK 3.2 SECONDARY MINING

MANPOWER

1.5 person/month (execute as planned)

MAIN PROGRESSES

The secondary mining and collection of waste rock/tailing and industrial wastes/residuals are explored from one material to another and from one refractory metal to another.

TASK 3.3 WASTE PROCESSING

MANPOWER

7 person/month (execute as planned)

MAIN PROGRESSES

The state of the art on the treatment/processing of the identified waste/residual materials are explored. The treatment/processing methods involve how to upgrade the waste/residual materials and how to make it possible for metallurgical extraction of refractory metals.

ACTION PLAN

The innovative methods for treatment/processing of waste/residual materials will be explored. The results will be presented in D32.

TASK 3.4 EXTRACTIVE METALLURGY

MANPOWER

10.5 person/month (execute as planned)

MAIN PROGRESSES

The state of the art on the metallurgical extraction of refractory metals from the identified waste/residual materials are explored. The inolved extraction methods include pyro-metallurgical extraction methods, hydro-metallurgical extraction methods, and, in quite many cases, hybrid of pyro- and hydro-metallurgical extraction methods. For some extraction methods case studies are provided.

ACTION PLAN

The innovative methods for metallurgical extraction of refractory metals from the identified waste/residual materials will be explored. The results will be presented in D32.

TASK 3.5 ENVIRONMENTAL FOOTPRINT

MANPOWER

4 person/month (execute as planned)

MAIN PROGRESSES

The work is in progress.

ACTION PLAN

The environmental footprint of the concerned refractory metals will be explored. The results will be presented in D351.

CONCLUSIONS

In this work package the secondary resources (waste rock/tailings, industrial wastes/residuals, etc.) that contain concerned refractory metals (W, Mo, Nb, Ta and Re) are identified and listed; the existing and innovative technologies for secondary mining, waste processing and extractive metallurgy are explored one metal by another. The environmental footprint of these metals is also considered in order to diminish these metals' environmental impacts as well as to promote the recycling of these materials from the waste streams.

The mapping and state of the art on the recovery of refractory metals from secondary resources are available in D311 and D31.

The Innovation potential in the recovery of refractory metals from secondary resources and environmental footprint of refractory metals will be given as D32 and D351, respectively, in the future.

WP 4 – SECONDARY RESOURCE (URBAN MINING)

WP	4	WP Leader	IMN
Manpower expected	29 in total	Man	
Contribution to Deliverables (number and title of each deliverable)			
D 4.1 Mapping the secondary resources in the EU (urban mines) – submitted in Month 5 D 4.2 State of the art on the recovery of refractory metals from urban mines – Submitted in Month 5			
Contribution to Milestones (number and title of each milestone)			
MS4 Identification of the knowledge required for the construction of the multi stakeholder platform from WP4 – achieved in Month 3 MS10 Delivery of the State of the art in urban mining, pretreatment and extractive metallurgy for D41 – achieved in Month 5			
Main achievements – Progress			
In the reporting period, WP4 partners worked on the main objectives of the WP. i.e. mapping of end-of-life products which contain refractory metals in EU by tracing and tracking of the refractory metal containing waste products and analysis of the systems for collection and presorting of the waste, as well as identification of the existing recycling technologies and gaps to be addressed by determination of state-of-the-art technologies in pretreatment and extraction. Project partners performed extensive literature studies and collected in-house knowledge on relevant information on the examined refractory metals, to get a broad picture of the current situation in recycling of end-of-life products which contain tungsten, molybdenum, rhenium, tantalum and niobium. Wide range of applications was identified to determine potential sources of refractory metals in the end-of-life products. Studies were performed to determine the existing systems of collection of end-of-life products and factors influencing the collection rate of individual metals. Various technologies used in pre-treatment of refractory metal bearing secondary materials and technologies applied in metal value recovery from pre-treated materials were identified and described to present a comprehensive overview of the state-of-the-art in development and application of recycling technologies. Beside description of the state-of-the-art situation also areas for improvement for more efficient recycling were identified together with barriers which hamper refractory metals recycling from end-of-life products. Within the reporting period the planned two deliverables containing results of the studies were submitted on time and one Milestone as planned was reached. The developed results were presented at the first MSP-REFRAM workshop on 30&31 May 2016 in Barcelona and provided a solid basis for discussion with invited experts. Input of the experts and results of the discussion will be used in further steps of activities carried by WP4 partners, i.e. in determination of best practices in the area of refractory metals containing end-of-life products for the selected applications and in determination of applications where recycling may present a significant opportunity.			
Main difficulties – Delays			
The main difficulty faced by the project partners was scarcity of the data on individual metals and recycling processes applied in industry, especially from the economic point of view, mostly resulting from confidentiality of the information, however no delay in workpackage tasks execution was observed.			
Scientific publications, patents (beneficiary name and type of publication)			

Journal:
Int. Conference Oral:
Int. Conference Poster:
Proceedings:
Patent:

Effective collaboration between Beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
CEA																					
AMPHOS21																					
BRGM																					
CARTIF																					
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E-MINES																					
ERAMET																					
GTK																					
ICCRAM																					
IDENER																					
IMN	X	X	X	X	X			X	X	X			X	X	X	X	X	X	X		X
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VTT		X							X												
LGI																					
PROMETIA																					

INTRODUCTION

The WP 4 is focused on identification of the existing technologies for recycling of refractory metals containing end-of-life products. WP4 addresses the problems of recycling in its whole complexity, i.e. by identification of the source materials, methods of collecting as well as technological solutions applied for metal value recovery.

MAIN RESULTS

TASK 4.1 TRACING AND TRACKING (DETECTION) OF THE REFRACTORY METAL CONTAINING WASTE PRODUCTS

MANPOWER

MAIN PROGRESSES

The refractory metals are highly strategic resources mainly imported to Europe as metals or in products and product components because the primary production is very limited. Therefore it is important to map and valorise better the secondary resources which exist in Europe. The aim of the Task 4.1 is to identify the end-of-life waste products (urban mine) and their components containing refractory metals, estimate their quantities and form in the products in the limits of the available data, to identify the existing collection infrastructures and the incentives for delivery of waste products to legal operator.
Within the scope of the performed studies mapping of the end-of-life waste and scrap which contain individual refractory metals was performed. The following applications of the studied refractory metals were identified:

Niobium - steel products, superalloys, niobium-based alloys, fine ceramics, waste electrical and electronic equipment, WEEE, end of life vehicles (EOV),
Tantalum – capacitors, other electronic components, cemented carbides, Ta superalloys, process equipment, medical applications, WEEE, End-of-Life Vehicles, other end-of-life applications,
Molybdenum - stainless steel, molybdenum grade alloy steels & irons, molybdenum grade superalloys, molybdenum metal & alloys, chemical uses of molybdenum, Ni-Mo catalyst, End-Of-life vehicles,
Rhenium – Pt-Re reforming catalysts, superalloys, other Re containing products,
Tungsten - spent Ni-W catalyst, cutting materials, heavy mining, drilling and construction equipment, superalloys and special purpose steels, electric and electronic devices, chemical compounds.
It was found that there are still significant gaps in the knowledge on the reserves of refractory metals in end-of-life waste. It is possible to find information on different applications and at least coarse level information on distribution of the use of refractory metals between applications. However, in many cases it is difficult to find public data even for coarse assessment of the quantities of refractory metals in end-of-life and manufacturing waste.
Results of the performed studies were collected in a form of Deliverable D 4.1 Mapping of secondary resources in the EU.

DIFFICULTIES

ACTION PLAN

TASK 4.2 COLLECTION AND PRESORTING OF THE WASTE /URBAN MINING

MANPOWER

MAIN PROGRESSES

The task is focused on strengthening the raw material supply by using the resources temporarily locked up in Urban Mines. The task is focused on identification of existing infrastructures for collection, identification of economic incentives for the delivery of waste product to legal operators as well as on determination of applications for which recycling may present a significant opportunity. Various available information on collection rates of individual elements were compiled and compared, e.g.:

Refractory Metal	Functional Recycling	Old Scrap collection rate	Old scrap in the recycling flow
Mo	>25-50%	>25-50	>25-50
Nb	>50	>50	>25-50
Re	>50	>10-25	>25-50
W	>10-25	>25-50	>50
Ta	<1	>10-25	>1-10

The collection systems for various refractory metals has been identified, e.g. producer responsibility specified in ELV directive for End-of-Life Vehicles collection, producer responsibility specified in WEEE directive for Waste electrical and electronic equipment (WEEE), companies responsible for organisation of the collection for telecom and data-com infrastructure, collection of hospital waste, crematories for medical applications, hearing aids, pacemakers, etc., collection of industrial scrap for hard metal tools, process equipment, steel bridges, water tanks, high temp. furnace parts, turbines; rocket nozzles.

Although the legislation regulates ELV and WEEE collection, there are no specific collection or separation systems for various refractory metals containing electronic components.

Additionally some reasons for low collection of the products were identified, such **as**:

- Missing collection of the selected WEEE products groups,
- Export of used EEE products or illegal export of WEEE out the EU,
- High losses during pre-processing, depending on whether manual or mechanically dismantling is applied
- The recycling rate of WEEE is poor for some of the metals because the whole recycling process (dismantling, pre-processing, end-processing) focuses and is tailored toward the extraction of bulk materials,

These reasons for the low overall recycling rates indicate that increasing the recycling efficiency will require more than the further development of technology solutions. Legal initiatives to increase recycling rates, improve process quality and hinder export out of the EU of WEEE are also required. Alternatively, reuse can be seen as much more practicable option than recycling. At present, several companies are already successfully collecting and reusing their own products and components

Results of the performed studies were collected in a form of Deliverable D 4.1 Mapping of secondary resources in the EU.

DIFFICULTIES

ACTION PLAN

TASK 4.3 PRE-TREATMENT

MANPOWER

MAIN PROGRESSES

The Task 4.3 activities were focused on mapping of current recycling pre-treatment techniques. Sorting and collecting are quite important pretreatment procedures for the recycling of refractory metals from waste (such as end-of-life screens), as they often need to be enriched before they can be extracted efficiently from these waste. Within the scope of the study a whole range of pre-treatment processes was analyzed, which are currently used in technologies for recycling of refractory metals. They are mostly applied to: (i) ensure that the material has suitable size for further treatment; (ii) ensure a homogenous composition of the material; (iii) remove the impurities from the material. The pre-treatment technologies strongly depend on the further recycling process on one hand and on the raw materials on the other.
These techniques include the following:

(a) Physical dismounting/sorting and/or sorting by chemical analysis into different grades,
(b) Crushing, screening, milling and grinding,
(c) Degreasing, acid cleaning to remove the impurities;
(d) Compression, roasting, chlorination, alkali fusion, oxidation and electrolytic dissolution, etc.

In some situation similar techniques are needed for pre-treatment of materials which contain different refractory metals, e.g. pretreatment of spent Ni-W catalyst is similar to that for pre-treating of Ni-Mo catalyst, recovery of individual elements from superalloys. Currently pretreatment of WEEE scrap and End of Life Vehicles is conducted according to the defined procedures following the relevant directives.
Project partners collected available information on the pre-treatment of end-of-life materials which contain individual refractory metals and presented the results in the Deliverable 4.2 State of the art on the recovery of refractory metals from urban mines.

DIFFICULTIES

ACTION PLAN

TASK 4.4 EXTRACTION

MANPOWER

MAIN PROGRESSES

The activities in task 4.4 addressed mapping of currently used technologies for metal value recovery from end-of-life products. The technologies are often closely linked to the pretreatment processes as described in task 4.3.

The project partners identified and described various technologies for recovery of metal value by hydrometallurgy, melting metallurgy, direct recycling and semi direct recycling. The following technologies currently used in refractory metals recovery were identified and described:

Recovery of tantalum – from electronic waste by oxidation process followed by mechanical and chemical treatment, from non-electronic waste such as cemented carbides by chemical processes and physical processes; recycling of Ta from superalloys by remelting and by extraction
Recovery of molybdenum – from steel scrap by smelting, from hydro-refining catalysts by leaching, smelting; from other waste by pyrometallurgy.
Recovery of tungsten from cemented carbide scrap by zinc process, cold stream process, chemical treatment, by selective dissolution, from heavy metal alloys scrap by oxidizing the scrap, milling and screening and then by hydrogen reduction or by the melt bath process, and by other described methods, also from other products, e.g. steel scrap, spent catalysts, electrodes etc.
Rhenium recovery from superallys and alloy scrap by methods developed by H.C. Starck and by Stoller, from spent Pt-Re catalysts by complete dissolution of the alumina substrate and by selective dissolution and recovery of rhenium and platinum
Recovery of niobium - refining of production scraps from niobium and nioboxide into pure metal/oxide qualities by H.C. Starck's integrated recycling process .
The analysed technologies were described in the Deliverable 4.2 State of the art on the recovery of refractory metals from urban mines, where also some new technologies which are currently under development were identified.
Significant lack of technologies for recovery of some metals, e.g. niobium, in industrial practice was observed.

DIFFICULTIES

ACTION PLAN

TASK 4.5 ENVIRONMENTAL FOOTPRINT

MANPOWER

MAIN PROGRESSES

The task is planned to start in Month 6.

CONCLUSIONS

Within the frame of the first 6 months of the project a lot of information on refractory metals recycling conditions and technologies was collected and processed. The results were discussed at the first MSP-REFRAM workshop which provided additional feedback to the already elaborated reports.

The performed studies made identification of weak spots in recycling related areas, such as in logistics of collection of end-of-life products, in technological development, possible.

The collected information provide a solid basis for further activities of WP4, i.e. Identification of gaps to be addressed, identification of barriers to refractory metals recycling and determination of applications where recycling may present a significant opportunity.

WP 5 – THE CONCEPTS AND SCENARIOS OF SUBSTITUTION

WP	5	WP Leader	VTT
Manpower expected	13	Man	5.3

Contribution to Deliverables (number and title of each deliverable)

Task 5.1 (M1-M10) Impact of substitution scenarios over the different applications in RM value chain.
Start date: December 2016*; End date:* September 2016, *Lead: Witold Kurylak (IMN Gliwice), Contributors: Santiago Cuesta Lopez (ICCRAM), Katarzyna Bilewska (IMN Gliwice), Adrianan Wrona (IMN Gliwice), Marjaana Karhu (VTT), Päivi Kivikytö-Reponen (VTT)*
contribution in pm (first 6 month period): ICCRAM (1,5 pm), IMN (1.3 pm), VTT (0.9 pm)

Task 5.2 (M5- x) *Start date:* Month Year*; End date:* Month Year, *Lead: Santiago Cuesta Lopez (ICCRAM), Contributors: Santiago Cuesta Lopez (ICCRAM), Katarzyna Bilewska (IMN Gliwice), Adrianan Wrona (IMN Gliwice), Marjaana Karhu (VTT), Päivi Kivikytö-Reponen (VTT)*
contribution in pm (first 6 month period): ICCRAM (0,5 pm), IMN (0 pm), TUDELFT 1 pm), VTT (0 pm)

D521 Report on refractory metal reduction potential – potential substitutes, responsible IMN
Mo: IMN, VTT; W: ICCRAM, VTT; Re: IMN; Nb: TU Delft, VTT; Ta VTT

D531 Report on refractory metal increase potential – substitutes non-refractory metals, , responsible ICCRAM
Mo: IMN, VTT; W: ICCRAM, VTT; Re: IMN; Nb: TU Delft, VTT; Ta VTT

Contribution to Milestones (number and title of each milestone)

M51, Identification of the knowledge required for the construction of the multi stakeholder platform from WP5, Delivery of D621 with the data related to substitution, February 2016, (VTT)
contribution in pm: 0.1

Main achievements - Progress

Data survey and writing of D521, data survey according to following outline IMN.

1. D5.1. Nb, Mo, Ta started, W and Re still lacking. W will be done in first two weeks in July, concerning Re already information collected, not yet organized. Deadline 31. October 2016. The deliverable include properties, applications, value chain, environmental and economy, and substitution, focus on
    - Potential to substitute refractory metals, and/or reduce the use of the metals in considerable volume.
2. D5.2 outline, content described, template will be done. Deadline 31. December 2016. The second deliverable focus is on:
    - The potential and realistic substitutes will be found in order to maintain demand in current level versus potential of usage increase
    - The scenario of the present usage continues, no potential substitutes are found, and refractory metal demand will increase.
    - The refractories will substitute the less performing elements in large amounts.

Main difficulties - Delays

Data for end use or volumes is not found per country, Eurostat have only Ta and Wo statistics. In the beginning of the project we waited for the data from other deliverables, in order to avoid the duplicate work.
Scientific publications, patents (beneficiary name and type of publication)
Journal: - Int. Conference Oral: at Info Day on Horizon 2020 about NMBP (Poland) - presentation about experiences in European projects based on MSP-REFRAM project (IMN). Int. Conference Poster: - Proceedings: - Patent: -
Effective collaboration between Beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
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VTT									x		x					x		x			
LGI																					
PROMETIA																					

INTRODUCTION

This WP has as a main objective to discuss and analyze the **map of substitution for RM within their most relevant applications in EU industry according to a threefold criteria of social, economic and strategic importance.** Such a map needs to be considered

- **as part of the full value chain analysis carried out in WP1**, and
- **a factor in the priority and definition of clear actions in the fate of RM regarding its supply, recycling/waste management strategies and loops**.

The WP will focus on **substitution analysis that is a key concept that must be transversally present to the study and design of the full value chain**.

A holistic approach will be used considering four scenarios:

- 1) Potential to substitute the refractory metal, paying special attention to existing technological barriers, and/or reduce its use in considerable volume. D5.1 (D22)
- 2) The potential and realistic (present high TRL) substitutes will be evaluated in order to maintain demand in current consumption level. D5.2 (D23)
- 3) The scenario that the present usage continues, no potential substitutes are found, and refractory metal demand will increase. D5.2 (D23)
- 4) The refractories will substitute the less performing elements in large amounts. D5.2 (D23)

Evaluating the substitution potential and impact – creating the understanding of the substitution potential of selected refractory metals in both ways (decrease and increase) throughout the refractory value chains.

Applications and value chains selected in WP1, will define a clear scenario in which a specific evaluation of substitution potential for each RM will be carried out according to the following possibilities

- **1) substitution without the reduction in functionality. Reduction – use less material to achieve the same level of functionality in a given product;**
- **2) Alternative material - replace one material for another without loss of functionality;**
- **3) Alternative system - replace one/several components within the same product;**
- **4) Alternative products - replace existing technology with different products and/or services.** The technological readiness level of the potential material scientific innovations is taken into account.

MAIN RESULTS

TASK 5.1

The aim of this task is to **summarize the state of art of refractory metal application volumes f**orwarded by the cumulative impact of four scenario evaluation is generic level: the reduction potential and the metal interrelations (tungsten, tantalum, rhenium, molybdenum and niobium).

First scenario evaluation will be done in the D5.1

1. Potential to substitute refractory metals, and/or reduce the use of the metals in considerable volume.

MANPOWER

5.3/13 pm (situation after first 6 months).

MAIN PROGRESSES

The data collection for the refractory metals is in good progress. Data collection for substitution is starting. The deliverable template formulated, and data have been transferred to the template. The lacking data is analysed, and the needed new data is identified.

DIFFICULTIES

Some of the needed data may not be available.

ACTION PLAN

Agreed better to focus on subjects which considered relevant and data available. e.g. focusing on some applications will be done, focusing on finding sources about substitution on basis e.g. price large volume applications.

TASK 5.2

The aim of this task is to **summarize the state of art of refractory metal application volumes f**orwarded by the cumulative impact of four scenario evaluation is generic level: the reduction potential and the metal interrelations (tungsten, tantalum, rhenium, molybdenum and niobium).
Scenario 2-4 evaluation will be done in the D5.2
2. The potential and realistic substitutes will be found in order to maintain demand in current level versus potential of usage increase
3. The scenario of the present usage continues, no potential substitutes are found, and refractory metal demand will increase.
4. The refractories will substitute the less performing elements in large amounts.

MANPOWER

MAIN PROGRESSES

The data collection for the refractory metals is in good progress. Data collection for substitution starting.

DIFFICULTIES

Some of the needed data may not be available.

ACTION PLAN

Agreed that is better to focus on subjects which considered relevant and data available. e.g. focusing on some applications will be done, focusing on finding sources about substitution on basis e.g. price large volume applications.

CONCLUSIONS

The data collection for the refractory metals is in good progress. Data collection for substitution is starting. The deliverable template formulated, and data have been transferred to the template. The lacking data is analysed, and the needed new data is identified.

WP 6 – KNOWLEDGE MANAGEMENT

WP	6	WP Leader	IDENER
Manpower expected	14 (Whole project)	Manpower	4.48

Contribution to Deliverables (number and title of each deliverable)

D6.1 Set of internal KM tools – Achieved

D6.2 Report on knowledge identification and measurement - Achieved

Contribution to Milestones (number and title of each milestone)

No milestones allocated within the first 6 months of the project

Main achievements - Progress

Work done during the first six months of the project has provided the following achievements:

- Production of project Knowledge map summarising knowledge status, knowledge responsible, IPR status and deliverable where this information can be found.
- Set-up of Internal Knowledge management tools. The Electronic Content Collaboration Platform (ECCP) from LGI has been used as based and several tools have been included. Specifically, these tools are: Forum, Wiki and Calendar.
- Deliverables produced up to date have been reviewed and IDENER team is working on information indexing and storage. Also, cross-check of presented information against knowledge map has been done in order to identify main knowledge gaps, to be addressed in experts' workshop and further deliverables.

Main difficulties - Delays

No difficulties have been found and no delays have occurred during the execution of this WP activities.

Scientific publications, patents (beneficiary name and type of publication)

Journal: None

Int. Conference Oral: None

Int. Conference Poster: None

Proceedings: None

Patent: None

Effective collaboration between Beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
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LGI										**X**											
PROMETIA																					

INTRODUCTION

IDENER has set-up the internal KM tools required for the proper execution of the project. These tools are based in Open source software and are customised in order to meet project needs and requirements. Specifically, this internal KM tools are:
- Knowledge management web application, in particular to efficiently share technical data and documents with the consortium and the external experts. These allows building forums and wikis to support collaborative work.
- Face-to-face meetings. The knowledge manager (member of IDENER team) has discussed with WP1 to WP5 leaders in order to coordinate and retrieve all the produced information.
- Remote meeting tools.

This way, the following objectives for the WP can be identified:
- To set the framework for internal knowledge management through the implementation of MSP-REFRAM customised KM tools
- To identify existing knowledge and gaps in close cooperation with WP1 to WP5 leaders
- To retrieve and storage knowledge to be generated through WP1, WP2, WP3, WP4 and WP5
- To transform such knowledge into reports, factsheets, infographics, etc. to be used by the Document Management System (DMS) and into classified data (databases or *.xml files) to be used by the Decision Support System (DSS)
- To set the public DMS and DST as part of the results from the interaction with the multi stakeholder platform

MAIN RESULTS

TASK 6.1 SET-UP OF INTERNAL KM TOOLS

MANPOWER

Expected: IDENER (1 pm),LGI (1 pm)
Actual manpower: IDENER – 1 pm; LGI – 1.18 pm

MAIN PROGRESSES

The aim of this task is to set: Knowledge management web application; Face-to-face meetings and remote meeting tools. The following actions have been carried out:

- Identification of most suitable KM web application (preferably Open source) - Electronic Content Collaboration Platform (ECCP) from LGI, already used by PROMETIA with excellent results has been selected
- Setting up of KM tools. The following tools have been added to the ECCP
    - Forum: where partners can address their questions. Several categories have been considered
    - Wiki: where main information for 5 metals can be gathered
    - Calendar: where partners can see information about meetings
    - ECM: Electronic Content Management application for documents storage and deliverables and milestones workflow tracking.
- Link and integration with Project website
- Communication to Project partners about new tools

DIFFICULTIES

No difficulties have been found during this task execution. Smooth cooperation with LGI has been carrie dout and tools bugs have been amended.

TASK 6.2 IDENTIFICATION AND MEASUREMENT OF KNOWLEDGE

MANPOWER

Expected: IDENER (1 pm)
Actual manpower: IDENER – 1 pm;

MAIN PROGRESSES

The aim of this task is to map the knowledge to be produced through the project and to identify knowledge sources as well as IPR aspects. The following actions have been carried out:

- IDENER sent templates to WP leaders
- WP leaders filled the document and sent it to WP partners in order to fully complete it
- WP leader received WP partners feedback, reviewed it and produced final template
- IDENER received final templates from WP leaders and produced final knowledge map

Main outcome of this task is the Knowledge map of the project, summarising knowledge status, knowledge responsible, IPR status and deliverable where this information can be found.

DIFFICULTIES

No difficulties have arose during the execution of this task.

TASK 6.3 KNOWLEDGE RETRIEVAL AND STORAGE

MANPOWER

Expected: IDENER (2pm), E-MINES (1pm)
Actual manpower: IDENER – 0.5 pm; E-MINES – 0.

MAIN PROGRESSES

The aim of this task is to retrieve knowledge from WP leaders and review the information thanks to the Electronic Content Collaboration Platform app for document validation. Then, this information will be indexed through metadata and will be storage in KM tools. The following actions are being carried out:

- Periodic meetings between WP leaders and K. Manager
- Reception of the information in a report format. Review and validation. After the first 6 months of the project, the following deliverables have been reviewed: D1.5 (results from first workshop), D2.1, D2.2, D3.1, D3.2, D4.1, D4.2

- Indexing according to the metadata.
- Storage of the information on DSS, DSM and GKR

DIFFICULTIES

At this moment no difficulties have been found.

TASK 6.4 KNOWLEDGE TRANSFORMATION

MANPOWER

Expected: IDENER (5pm)
Actual manpower: IDENER – 0.8 pm.

MAIN PROGRESSES

The aim of this task is to transform information from report to "public document" format and *.xml format.
The following actions are being carried out:

- Information transformation from report to public document
- Information transformation for the DSS:
  1. Ontology definition,
  2. Data normalisation,
  3. Data Semantic Analysis,
  4. Key information extraction and
  5. Data storage (database building/*.xml storage).

DIFFICULTIES

No difficulties have been found at this stage.

TASK 6.5 SET-UP OF EXTERNAL KM TOOLS

MANPOWER

N/A

MAIN PROGRESSES

The aim of this task is to set-up and release of Beta version of: Document Management System (DMS) and Decision Support System (DSS).
This task is not included in the first six months of the project.

CONCLUSIONS

During the first six months of the project the WP activities have been conducted according to project time plan with no deviations. Cooperation between partners has been smooth and all the period objectives have been achieved.

WP 7 – CAPACITY, DISSEMINATION, COMMUNICATION

WP	7	WP Leader	ICCRAM
Manpower expected	10 person/month	Man	

Contribution to Deliverables (number and title of each deliverable)

Contribution to:

- D7.3 Dissemination and Communication Plan
- D7.4 Project communication toolkit led by LGI (13 June 2016)
- D7.5 Newsletter and video

Contribution to Milestones (number and title of each milestone)

N/A

Main achievements - Progress

The main progress is related with the definition of the target groups and the tools used to communicate with the audience and to disseminate the project's results such us: Project logo, project website, project templates, template, poster and rollup. Several KPIs have been defined to adapt the content and website structure to best respond to the users' needs.

Regarding the reproducibility and transferability of the project, a meeting in Burgos (Castilla y León Region) in October with other European Regions interested on refractory metals to understand the alignment and reproducibility in those Regions has started to be organized.

Main difficulties - Delays

Deliverable D7.3 was delayed due to the many communication/dissemination activities that were being carried out at the same time period. In addition, extra time was needed to develop and refine the communication messages and identify potential events for the projects.

Scientific publications, patents (beneficiary name and type of publication)

Journal:

Int. Conference Oral:

Int. Conference Poster: Recycling Expo-2016, Berlin (Germany) from 25-27 July 2016

Proceedings:

Patent:

Effective collaboration between Beneficiaries (put crosses in boxes)

	CEA	AMPHOS21	BRGM	CARTIF	CHALMERS	E-MINES	ERAMET	GTK	ICCRAM	IDENER	IMN	ADE	UNIKL	LUT	LGC	MEFOS	NTUA	TU DELFT	VTT	LGI	PROMETIA
CEA									X	X		X				X				X	X
AMPHOS21																					
BRGM																					
CARTIF																					
CHALMERS																					
E-MINES																					

ERAMET																					
ICCRAM	X	X								X		X				X				X	X
IDENER	X								X			X				X				X	X
IMN																					
ADE	X								X	X						X				X	X
UNIKL																					
LUT																					
LGC																					
MEFOS	X								X	X		X								X	X
NTUA																					
TU DELFT																					
VTT																					
LGI	X								X	X		X					X				X
PROMETIA	X								X	X		X					X			X	

INTRODUCTION

WP7 Capacity, Dissemination and Communication, aims to:

- Boost actions to bring together industrial clusters and EU networks (at all levels of the value chain) within industrial sectors of relevance for the refractory metals will be set up.
- Increase the impact of MSP-REFRAM by aligning its results with the smart specialisation strategies of main EU regions, working in or with resources of, refractory metals.
- Trace a roadmap of transferability for the MSP-REFRAM approach and strategy to other RMs sharing core similarities with refractory metals.
- Provide the infrastructure and the opportunities for facilitating the dissemination of the activities targeted by MSPREFRAM, empowering the knowledge transfer between the partners, and fostering external communication of the results.
- Organise the communication around the project activities and outputs.

WP1 is structured in three task to achive the described objectives.

MAIN RESULTS

Task by task, highlight the main progresses, delays, difficulties with analysis comments, action plan if needed. Give information and short analysis on manpower (expected, realized, explanation on discrepancies)

TASK 7.1 ALIGMENT AND REPRODUCIBILITY.

MANPOWER

Assigned 2,5 person/month.

MAIN PROGRESSES

The work carried out has consisted on the planification of a meeting in Burgos (Castilla y León Region) in October with other European Regions interested on refractory metals to understand the alignment and reproducibility in those Regions. The meeting will be on 27th of October. The objectives of the meeting will be to Set-up an European-wide mirror of Regions considering refractory metals and the Circular Economy policy within their Smart Specialization Strategy (RIS3).

In addition, ADE has participated in the workshop The Sustainable Circular Economy – new opportunities for raw materials, chemicals and water, on the 15th of March in Brussels (organized by Cefic, ERRIN and East & North Finland) with the presentation Sustainable Circular Economy in Castilla y León: The Raw Materials component where the MSP-REFRAM project was also presented. The conference was organized by Cefic, ERRIN and East & North Finland. During this meeting, opportunities and collaboration strateties for the regions and sector involved where evaluated. The collaboration between different regions aligned by the RIS3 was promoted.

DIFFICULTIES

ACTION PLAN

1-Regions meeting in Burgos: Lapland (Finland), Lazio (Italy) and (Checzk Republic) Greece and Lower Silesia (Poland)
2-Review of the RIS3 for other European Regions to detect other Regions really interested on Refractory Metals (JRC Sevilla- Institute for Prospective Technological Studies (IPTS)).
3-Meeting with ERRIN

TASK 7.2 TRANSFERABILITY

MANPOWER
MAIN PROGRESSES

This task will start on month 9

DIFFICULTIES

ACTION PLAN

TASK 7.3 DISSEMINATION AND COMMUNICATION

MANPOWER

6 person/month

MAIN PROGRESSES

During this period, two deliverables have been submitted to the comission, D7.3 Dissemination and Comunication plan and D7.4 Project Comunication toolkit.
The target groups and the tools used to communicate with the audience and to disseminate the project's results have been defined. The MSP-REFRAM logo was created to develop the project's identity. A presentation template was designed and distributed. A rollup was designed in order to reflect the mission and expected outcomes of the project. The rollup includes the main messages, keywords and the consortium members. The public MSP-REFRAM website was officially launched in March 2016 at the following address: http://prometia.eu/msp-refram/ The website content includes: what the project is about, what the project is delivering, and why, including its vision, who the partners of the project are, what the past and present related projects in the field are, where to find more information on the topic or related topics. Five KPIs were seleted in order to adapt the content and website structure to best respond to the users' needs.

Several journals for publication and their impact factor have been identified and Scientific dissemination KPIs have been defined: people attending the workshops and final conference, participation in events: these include poster presentations and oral presentations, scientific papers published in journals.

The following deliverables were completed and submitted to the EC:

- D7.3 Dissemination and Communication Plan: The main purpose of deliverable D7.3 is to describe the Communication Strategy of MSP-REFRAM and to give visibility to the entire process. This document includes a section on the context of the project and identifies the communication objectives, the target groups and the key messages. The document also defines the tools used to communicate with the audience and to disseminate the project's results. The scope includes all actions taken in and outside of the project in terms of knowledge dissemination and public communication on the project and its results.

- D7.4 Project communication toolkit led by LGI (13 June 2016): This deliverable includes all of the tools needed by the project's partners to communicate (logo, templates, website, rollup etc). It also provides a single, coherent identity for the promotion of the project.
- D7.5 Newsletter and video: The first newsletter was distributed on 29 June 2016 to nearly 150 persons following the first workshop in Barcelona on 30-31 May.
  Access e-newsletter here: http://eepurl.com/b5vZLf

DIFFICULTIES

ACTION PLAN

The dissemination material were produced for the First Workshop of REFRAM in Barcelona. The first newsletter was distribute and the video will be produced.

CONCLUSIONS

The main progress is related with the definition of the target groups and the tools used to communicate with the audience and to disseminate the project's results such us: Project logo, project website, project templates, template, poster and rollup.
To increase the impact of the project and to promote the reproducibility and transferability a meeting in Burgos (Castilla y León Region) on the 27th of October with other European Regions interested on refractory metals has been launched. Target groups and regions aligned by the RIS3 have been invited to participated in the event and present their regional specialization strategy in critical Raw Materials and Circular Economy.
A first analysis to identify mirror region to Castilla y León was performed in the workshop The Sustainable Circular Economy – new opportunities for raw materials, chemicals and water, on the 15th of March in Brussels (organized by Cefic, ERRIN and East & North Finland).