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**FUNDACION ICAMCyL:**
Centro internacional en materiales avanzados y materias primas de Castilla y León

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www.icamcyl.com
ICAMCyL, a reference competence center in raw materials

**Scientific Divisions**

- Integrated Computational Engineering & Materials Design Division
- Mining & Materials Processing Division
- Circular Economy, Sustainability & Resource Efficiency Division
- Additive Manufacturing & Components Division
- Materials Under Extreme Conditions Division

**Stakeholders-Patrons**

- ICAMCyL
- TRESCA
- INTEXMA
- Castilla y León
- tvitec
- Bench & Ground

**ADVANCED MINING TECHNOLOGIES**
- Exploration
- Classification
- Processing

**CIRCULAR ECONOMY**
- Waste
- Recycling
- Valorisation

**SUSTAINABILITY**
- New production methods
- Eco-innovation
- Resource efficiency

**NANOMATERIALS**
- Carbon-based
- MOFs
- Composites
- Alloys

**FABRICATION**
- Additive manufacturing
- Pilot lines
- Industry

**ENERGY & CLIMATE CHANGE**
- Batteries/fuel-cells
- CO₂ capture
- Smart cities

International Center for Advanced Materials and raw materials of Castilla y León (ICAMCyL)
ICAMCyL (Intercional Center for Advanced Materials and Raw Materials of Castilla y León)

Non-profit research foundation created by the main industries of Castilla y León region (Spain) in the sectors of automotive, manufacturing, advanced materials, engineering, mining and processing of raw materials. It constitutes a singular Competence Center with the objective of aligning and working towards regional Smart Specialisation Strategies (RIS3) and international policies.

XXI CENTURY SUSTAINABLE MINING

SCIENTIFIC INTERESTS

ADVANCED MINING TECHNOLOGIES
- Exploration
- Classification
- Processing

CIRCULAR ECONOMY
- Waste
- Recycling
- Valuation

SUSTAINABILITY
- New production methods
- Eco-innovation
- Resource efficiency

NANOMATERIALS
- Carbon-based MOFs
- Composite
- Alloys

FABRICATION
- Additive manufacturing
- Batteries
- Fuel cells
- CO2 capture
- Smartcities

ENERGY & CLIMATE CHANGE

EXPERTISE AND CAPACITIES

ENGINEERING & DESIGN

RAW MATERIALS RECOVERY
- CRMs

SUSTAINABLE PRODUCTION
- MARKET

RECYCLING
- DIGITAL MINE

WASTE VALORISATION
- FRAMEWORK POLICIES

INDUSTRY 4.0
- VALUE-CHAIN DESIGN

RESOURCE MANAGEMENT
- ECOSYSTEMS

EUROPEAN PROJECTS

ICAMCyL & IBERIAN SUSTAINABLE MINING CLUSTER

ISMC (Iberian Sustainable Mining Cluster)

MISSION & VISION

The Iberian Sustainable Mining Cluster (ISMC) has been created to halt the current decline of the mining sector in Spain, with special attention to the region of Castilla y León and the mining areas of the Province of León, in Northwest Spain. This decline affects the whole value chain as well as social acceptance of mining operations.

ISMC currently includes around 50 companies, research and institutional entities joining efforts to consolidate the strengths of the mining sector and its associated services, promoting sustained economic growth for its members, with special attention to SMEs.

OBJECTIVES

- Boost the mining sector and related services
- Promote growth and competitiveness
- Foster cooperation across industries
- Attract business and commercial opportunities
- Promote technological innovation and sustainability

EXPERTISE OFFER

- ISMC covers the whole mining value chain
- Wide coverage of raw materials & CRMs
- Pilots and new lines of research
- Stakeholders participation
- Clustering and matchmaking activities

ISMC & THE MINING VALUE CHAIN

ISMC has members across the whole mining value chain, from mineral extraction, exploration and production to business development, recycling and other services.

RAW MATERIALS & THE CIRCULAR ECONOMY

ISMC members cover a wide range of raw materials, including some essential critical raw materials (CRMs) used in high added-value, innovative products.

The development of a sustainable, low environmental impact mining will only occur through the improvement and integration of new methods, techniques and processes that allow the use and valorisation of raw materials and their by-products, always according to the principles of sustainability and circular economy.

EU LIST OF CRITICAL RAW MATERIALS (2017)

- Antimony
- Beryllium
- Cobalt
- Gallium
- Germanium
- Holmium
- Indium
- Iridium
- Lanthanum
- Lutetium
- Magnesium
- Natural graphite
- Neodymium
- Phosphorus
- Scandium
- Sulfuric acid metal
- Tantalum
- Thulium
- Vanadium

Research & exploration
- Deposit appraisal
- Design of mining complex
- Mining operations
- Site restoration

International Center for Advanced Materials and raw materials of Castilla y León (ICAMCyL)
TP 4. Natural Heritage, Cultural Heritage and the Spanish Language, and endogenous resources as basis of the sustainability of the territory.

Castilla y León eco-system: Innovation Triangle

Solid triangle of actors
Clear and solid commitment of the regional Government to promote ‘competence centers’, clusters and to create an innovation ecosystem

<table>
<thead>
<tr>
<th>Mineral raw materials</th>
<th>Development of mining and metallurgical techniques to increase the efficiency of processes</th>
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<tbody>
<tr>
<td></td>
<td>Use and promotion of waste</td>
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<tr>
<td></td>
<td>Development of competitive products from indigenous mineral raw materials (natural stone and others)</td>
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</tbody>
</table>

Castilla y León: a reference in endogenous resources
Castilla y León and the mining industry in short

2,519,87 inhabitants (2013)

Regional territorial area: 94,224 km²

9 provinces

2,249 city and town councils (30% Spain)

510 mines in operation

> 9,000 jobs
Currently -> Towards strategic mining

83 Coal deposits and tailings -> under identification for REE, graphite and other strategic minerals

10 Fe / 8 W / 6 Hg / 5 Cu
Others: Pb, Zn, Co, Si, Graphite and Lithium

León = biggest coal and anthracite reserve in Spain (1.341 million Tn)

Slate: Spain 1st worldwide market, with León covering 33% of national production

Castilla y León has 10% reserves of W of the World!

Biggest Uranium EU reserves in Salamanca (CyL)
Los Santos mine (W)

Open-pit deposit located approximately 50 kms from Salamanca. It produces 700-1,000 tWO3 per year.

Barruecopardo mine (W)

Open-pit tungsten mine, represents one of the largest tungsten reserves in Spain. In operation since the beginning of 2019 and is expected a production of 2,600 tWO3 per year. The mine is located 94 km from Salamanca.
Mining in CyL (II)

World leader in the production and distribution of roofing slate

**Borobia mine (Magnesite)**

In operation since 2015, located in the eastern border of Soria province. Produces around 73,000 t/year (12% of the national production).

**Belorado mine (Glauberite)**

Deposit located in the eastern boundary of Burgos province. CRIMIDES and Minera Santa Marta producing together around 940,000 t/year (76% of the national production).

Other minerals:

**K-Feldspar**: extracted from eolic sands in two open pits in Segovia and (with Li) in two quarries in Salamanca. The whole production is around 426,000 t/year (67% of the national total).

**Absorbent clays** (bentonite, attapulgite), **silica** (ferroalloys and glass, among other uses) and **wollastonite** (glass) are produced in several open pits.
FROM LIGHT TO DARKNESS IN LESS THAN 50 YEARS

5 Powerplants closed abruptly from 2019 up to 2021

EMPLEO
Trabajadores en el Régimen Especial la Minería del Carbón

51,420 (agosto de 1985)
2,265 (mayo de 2018)

Fuentes: Carbunión, Ministerio de Trabajo, Red Eléctrica de España y Comisión Europea.
TECHNOLOGICAL SOLUTIONS, CLUSTERS AND INNOVATION HUBS AS A MECHANISM TO SOLVE DEPOPULATION AND BOOST REINDUSTRIALIZATION.
Innovations enabled by interregional collaboration and the regional ecosystems will result in reduced costs for technology and hence increased development, and deployment.
Revitalizing the region: recovering coal mining places by the creation of ‘innovation poles’
REMIx – MIREU – S3P Mining industry as key EU Actions in raw materials

Smart and Green Mining Regions of EU

01/2017 – 06/2021
www.interregeurope.eu/remix/

Connect EU regions through their raw materials and minerals production, metallurgy and common S3 objectives

9 Partners | 1 Advisory Partner | 9 Countries | 8 Policy Instruments

Mining and Metallurgy Regions of EU

12/2017 – 11/2020
www.mireu.eu

Establish a network of mining and metallurgy regions across Europe

30 Partners | 17 Regions | 15 Countries

Towards a common strategy for securing reliable access to and supply of (critical) raw materials in the European Union area

“Advanced Materials for Batteries”
http://s3platform.jrc.ec.europa.eu/batteries

ICAMCYL Pilot leader “Sustainable Raw Materials Extraction & Processing” (Pilot 2)

“Mining Industry”
http://s3platform.jrc.ec.europa.eu/mining-industry

International Center for Advanced Materials and raw materials of Castilla y León (ICAMCyL)
BUILDING THE FUTURE OF THE MINING TERRITORIES
AND ASSEMBLING THE SPANISH MINING INDUSTRY

IBERIAN SUSTAINABLE MINING CLUSTER
Iberian Sustainable Mining Cluster (ISMC)

http://www.ismc-iberiamine.com/es/inicio/

**Raw Materials and Circular Economy**

**2017 CRMs**
- Antimony
- Baryte
- Gallium
- Germanium
- Magnesium
- Natural Graphite
- Scandium
- Silicon metal
- Natural Rubber
- Tantalum
- Bismuth
- Borate
- Helium
- HREEs
- Indium
- Niobium
- Phosphate rock
- PGMs
- Phosphorus
- Vanadium
- Tungsten
- LREEs
- Vanadium

**CORE CAPACITIES**
- EXPLOITATION
- PROCESSING
- MINING OPERATION
- DISTRIBUTION
- TRADING
- COMMERCE
- MARKETING
- TRANSPORT
- ENVIRONMENTAL IMPACT
- TRAINING
- CERTIFICATION
- QUALITY STANDARDS
- RESEARCH
- PREVENTION
- TECHNICAL ASSISTANCE
- CONSULTING
- ENGINEERING
- CIVIL WORKS

**ISMC** brings together +50 leading companies in the extraction of mining resources and raw materials, engineering, training, transportation, associated services and commercialisation. In addition, it covers a wide range of raw materials and critical raw materials.

International Center for Advanced Materials and raw materials of Castilla y León (ICAMCyL)
ISMC covers strategically the full value chain of sustainable mining

- 85% SMEs
- > 65 partners
- > 1300 jobs
- Turn over
- ≈ 480 M euros
- That will double in 2020 to 1.000M

Social Responsibility:
- Working & housing conditions
- Community development
- Post-closure programs

Environment:
- Land use & biodiversity
- Biodegradability
- Water & air emissions
- Acid rock drainage
- Water depletion
- Energy consumption
- Depleting high quality ores
- Rehabilitation

Economy:
- Permissions
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- Pilots and new lines of research
- Stakeholders participation
- Clustering and matchmaking activities
Operative Objectives

- Dynamisation, promotion and improvement of R&D competitiveness in mining
- Promotion & business development
- Strategic plan implementation & cluster development
- Communication & society
- Sustainable development, circular economy & 21st century mining
- Incorporation of industry 4.0 into the sector & mine digitalization

Strategic Lines

- PROMOTION & IMPROVEMENT OF COMPETITIVENESS
- BUSINESS DEVELOPMENT
- CLUSTER DEVELOPMENT
- COMMUNICATION & SOCIETY
- SUSTAINABLE MINING & CIRCULAR ECONOMY
- MODERNISATION OF THE MINING INDUSTRY

Working Groups

- WG1: International projects, technological projects and grants
- WG2: Business opportunities for the cluster and its members
- WG3: Technology surveillance
- WG4: Training, health and safety in the workplace
- WG5: Communication and marketing
- WG6: Legislation, European regulations and certifications

Iberian Sustainable Mining Cluster (ISMC)
Our methodology and strategy to promote innovation, business support and cross-sectoral collaboration between SMEs in ISMC cluster

The ISMC cluster is launching yearly competitive proposals funded by our regional government (Junta de Castilla y León) under Direct Funding or Business Support Services within three axes and hubs:

- Improving internationalization of SMEs
- Technological innovation for improvement of productivity and competitiveness
- Cooperative support, business development and awareness of the importance of mining industry in society
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Thank you for your attention

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