Raw Materials – fundamental for advanced materials and technologies

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EIT RawMaterials
The need for new materials in a changing world

Energy transition
- generators, lightweight composites, magnetic materials, energy storage; REE, Ga, Ge, Co, Pt, V, Li, Si

Industry 4.0
- sensors, servomotors; Sn, In, Ga, REE

E-mobility
- traction motors, energy storage, lightweight composites; Co, Li, Pt, REE

Images: Siemens, ChristophRoser, City of Berlin
Raw materials – a potential bottleneck as well as promising business opportunity for European industry
The EU action to ensure security of supply of raw materials

- The **Raw Materials Initiative** is the EU raw materials policy strategy.

- The **European Innovation Partnership on Raw Materials** brings together the entire raw materials community.

- **Horizon 2020**: EUR 600 million secured for raw materials (2014-2020)
  - **EIT RawMaterials**: EUR 400 million (2015-2021)
EIT brings together the three sides of the “knowledge triangle”: business, education and research.

EIT strengthens innovation in Europe by supporting new talent and new ideas through *Knowledge and Innovation Communities* (KICs).
Our partners – our network – our knowledge triangle
The strategic backbone of the KIC – The Partnership

- Excellent integration of the Knowledge Triangle
  113 partners, 22 countries

- Northern CLC: Luleå, Sweden
- Eastern CLC: Wroclaw, Poland
- Southern CLC: Rome, Italy
- Central CLC: Metz, France
- Western CLC: Leuven, Belgium
- Baltic Sea CLC: Espoo, Finland
- HQ: Berlin, Germany
EIT RawMaterials

Vision:
To develop raw materials into a major strength for Europe

Mission:
To boost competitiveness, growth and attractiveness of the European raw materials sector via radical innovation and entrepreneurship.

Objectives:
• Securing raw materials supply
• Designing solutions
• Closing material loops
EIT RawMaterials Themes

• Exploration and raw materials resource assessment
• Mining in challenging environments
• Increased resource efficiency in mineral and metallurgical processes
• Recycling and materials chain optimisation for End-of-Life products
• Substitution of critical and toxic materials in products and substitutions for optimised performance
• Design of products and services for the circular economy
The raw materials value chain

... and circular economy
EIT RawMaterials KAVA Activities

- Validation & Acceleration
- Learning & Education
- Regional Innovation Scheme and Internationalisation

In 2017 EIT RawMaterials supports 133 partner-coordinated projects, and in 2018 we expect more than 200

- Business Creation & Support
- Matchmaking & Networking

![Bar chart](https://example.com/bar-chart.png)

**Ta demand**

- Demand for emerging technologies 2013 / t: 500
- Production 2013 / t: 1,300
- Expected demand for emerging technologies 2035 / t: 2,100

![Pie chart](https://example.com/pie-chart.png)

**Ta supply 2011**

- Scarp recycling and industrial concentrates
- Tin slags
- Secondary concentrates
- Ores

Images: EC 2014; DERA 2016
OpTaRec – Objectives

- Improve **conditioning of secondary raw materials and processing of intermediate products by granulation and aligned separation techniques**
- Implement **innovative process automation** by combining batch and continuously operation with appropriate measurement
- Apply efficient **material logistic concepts** regarding results from modeling and linking the material flow simulation with energy consumption for optimisation

Challenges

- **cost of production and product quality**
- **securing material supply**
  - identification and extraction of tantalum from different kinds of industrial sludges
  - toxicity due to Co and Ni contents
  - avoidance of dust
DISPLAY - Upscale of Material Recovery from Display Applications and Printed Circuit Boards

• **Project goal**: Supply of a technical solution for a material oriented disassembly of display appliances and printed circuit boards

• **Approach**: Combination of electrohydraulic fragmentation (EHF), sensor based sorting (SBS) and the solvent based CreaSolv® process
ECO’COMBAT project: Prototype of a new high-voltage battery based on latest green and high-performance materials

- Sustainable & high energy active materials with low cobalt content (NMC 622 of Umicore)
- Functional protective coatings for active materials (ORMOCER® - trademark of Fraunhofer)
- Carbons with specific porous structure as pore former (Porocarb® - trademark of Heraeus)
- Carbon nanotubes as conductive additives (Graphistrength® - trademark of Arkema)
- High-voltage electrolyte with lithium salt LiFSI (latest development of Arkema)

The key up-scaling step lies in adjusting the materials and in producing highly compacted electrodes and high-voltage battery cells.
SIRIUS project: develop high capacity anodes for Lithium-ion batteries based on carbon coated silicon nanoparticles

Objectives
- increased energy density
- reduced quantity of anode materials in batteries
- substitute natural graphite
- intermediate cycle life (>500 cycles)

Approach
- Si nanoparticles from silane gas
- C decomposition on Si nanoparticles

Image: NANOMAKERS
International Master of Science in Advanced Materials for Innovation and Sustainability
AMIS - RM topics & Diploma

*General Curriculum in Materials Science with a special focus in:*

1. substitution of critical and toxic raw materials design for recyclabilit
2. sustainable functional materials,
3. material chain optimisation for End of Life products
4. product and services design for the circular economy.

The primary focus is on metal and ceramic materials; bio-base and polymer materials are covered in view of their substitution potential and other materials in the context of multi-material product recycling.

**Two Master of Science Diplomas (double-diplom):**
  + a diploma supplement associated with the EIT & KIC Raw Materials Label
Predictions

World Economic Forum (2015) Mining and Metals in a Sustainable World 2050:

• A strong move towards recycling and circularity
• Mining will not disappear
• The need for raw materials will not disappear
• Technology will matter more than ever
• Understanding value chains will be important
Thank you for your attention