Circularity strategies to secure supply
Results from international collaboration

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IRTC: what is it about?

- IRTC is an international “Round Table” project on approaches towards assessing materials criticality, taking place in the form of workshops at international conferences and online.
- Results are published as joint publications and workshop reports.
- The project shall advance the research in criticality assessment, foster international exchange, identify common ground and differences, and raise awareness towards materials criticality.
- It has created a network of internationally leading experts in criticality from research and industry.
- Aim 2021-2022: support company decision-making via a web-tool.
- More information and stay updated: www.irtc.info
Mitigating criticality via circularity

▸ What circularity strategies are relevant?
▸ Why would a company implement circularity strategies?
▸ How can we make circularity work?
▸ Does circularity mitigate criticality?

Publication title: The role of industrial actors in the circular economy for critical raw materials: A framework with case studies across a range of industries


▸ Submitted to Resources, Conservation and Recycling
## Case studies

<table>
<thead>
<tr>
<th>Product</th>
<th>CRMs</th>
<th>Industrial actor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superalloys for turbine blades</td>
<td>Rhenium</td>
<td>Jet engine manufacturer</td>
</tr>
<tr>
<td>Chemical processing catalysts</td>
<td>PGMs</td>
<td>Chemical plant/oil refinery</td>
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<tr>
<td>Permanent magnets in HDDs</td>
<td>REEs</td>
<td>Magnet manufacturer (Hitachi Group)</td>
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<tr>
<td>Consumer electronics</td>
<td>Various</td>
<td>Consumer electronics manufacturer (Apple)</td>
</tr>
<tr>
<td>Cooling for superconducting magnets in MRI machines</td>
<td>Helium</td>
<td>Hospital</td>
</tr>
</tbody>
</table>
What circularity strategies are relevant?

- Material recycling at end of life
- New scrap recycling
- Repairing
- Regeneration
- Reuse
Why would a company implement circularity strategies?

- Cost savings
- Reduced exposure to supply insecurity
- Reduced exposure to price volatility
- Regulatory constraints
- Brand reputation
How can we make circularity work?

Rhenium – Jet engine manufacturer

- Extraction
- Component manufacturing
- Product manufacturing
- Use
- Collection
- Disassembly
- Recycling
How can we make circularity work?

- Rhenium – Jet engine manufacturer

- Extraction
- Recycling
- Disassembly
- Collection
- Use
- Component manufacturing
- Product manufacturing
- Casting house and engine assembler

- Vertical integration
- Retained ownership
- B2B relationships
Does circularity mitigate criticality?
Summary

- Different types of circularity strategies could effectively decrease demand for raw materials: recycling of old scrap/new scrap, reconditioning, remanufacturing, reuse.
- Circular strategies can be effective to decrease costs, vulnerability to price spikes, comply with regulations, and strengthen reputation.
- Vertical integration of the value chain, retainment of ownership, and creation of mutual benefits are favourable conditions for circularity.
- Closed-loop circularity supports criticality mitigation, this is limited for open loops.
- www.irtc.info
Outlook

▸ Which factors affect the technical and economic feasibility of circularity strategies?

▸ How could circularity strategies be impacted by external factors (e.g. changing technology, consumer preferences, market conditions)

▸ What is the interplay of company functions and corresponding interests/authority/time horizon/risk tolerance in the design and implementation of circular business models?

▸ What is the role of legislative and regulatory environment in motivating/impeding circularity strategies?