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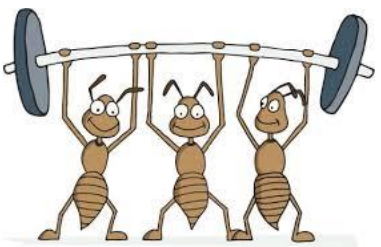
HyProS – A new Gemini-center for Hydrometallurgy

The 5th Hydrometallurgy Seminar Oslo March22, 2019
Nina Dahl, SINTEF

HyProS - **Hy**drokjemisk **Pro**sessteknologi i den **S**irkulære Økonomien

What is a Gemini Centre?



- The Gemini collaboration represents a model for strategic research coordination between parallel research groups at SINTEF, NTNU and the University of Oslo.
- The aim is to develop large-scale technical centres that produce higher quality results collectively than the individual groups would achieve independently.
- High-quality technical centres are in great demand internationally from both commercial clients and students. So the Gemini centres are working with a shared vision: **"Global excellence together"**

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Why HyProS as a Gemini Centre?

- General agreement that this field of research should be strengthened through:
  - Establishing a national forum for research cooperation
  - Strengthen focus on education and recruitment of relevant expertise
  - Contribute to developing a sustainable portfolio of research activities
- The role of this field in addressing some of society's major challenges:
  - Extraction and Recycling of critical elements necessary to secure future supplies
  - Focus on Circular Economy and efficiency in resource utilisation
  - Need for new, improved industrial separation processes to deal with complex waste streams and exploit lean raw materials – key technologies for the green shift
- UiO, NTNU and SINTEF have common ambitions - stronger together

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What is Hydrochemical Process Technology - Hydrometallurgy

- Solution based processes for selective separation and recovery of metals and other ions.
- Often because other approaches are not viable or too energy intensive
- Route to upgrading to products that can be applied in other applications or industries
- Can recover valuable elements from very low concentrations

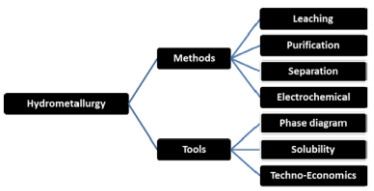

Figure 1. Methods and tools within Hydrometallurgy

Most common operations:

- Pretreatment
  - Crushing, grinding and fractionation
  - Physical mineral separation
- Separation
  - Leaching
  - Crystallization / Precipitation
  - Filtration
  - Solvent extraction
  - Ion exchange
  - Cementation
  - Membrane separation
  - Electrolysis

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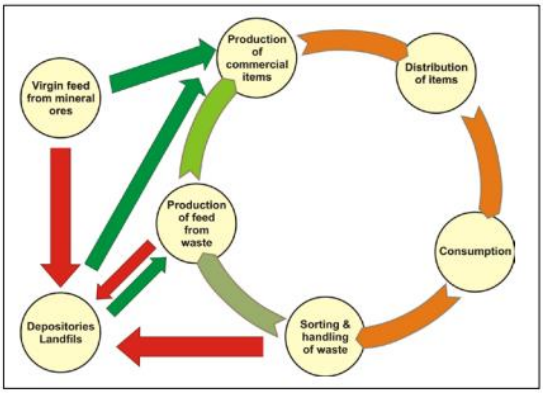
Hydrochemical Process Technology in the Circular Economy



Important for Process industry, including utilisation of waste streams (including landfills) as new feedstocks

2017 CRMs (27)			
Antimony	Fluorspar	LREEs	Phosphorus
Baryte	Gallium	Magnesium	Scandium
Beryllium	Germanium	Natural graphite	Silicon metal
Bismuth	Hafnium	Natural rubber	Tantalum
Borate	Helium	Niobium	Tungsten
Cobalt	HREEs	PGMs	Vanadium
Coking coal	Indium	Phosphate rock	

Important in order to secure supply of critical raw materials

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Circular Economy – the European focus

Important for achieving the EUs central strategy 2018 for Circular Economy

- **H2020 SC 5 - Climate Action, Environment, Resource Efficiency and Raw Materials**

SPIRE
Sustainable Process Industry through Resource and Energy Efficiency

Fulfilling key parts of UN sustainable development goals

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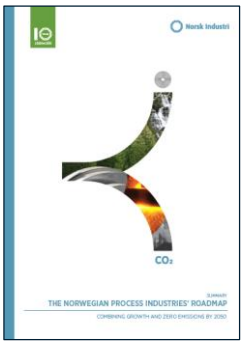
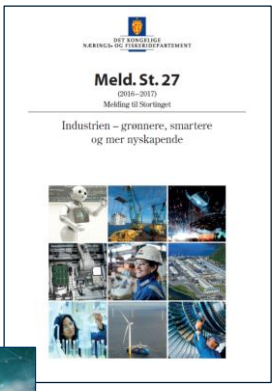
National Relevance

- Mineralstrategien (2013)
- Strategy for Green competitiveness (2017)
- Strategy for Industry (2017)
- Roadmap for Process industry
- Prosess21





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HyProS – Vision and Goals

Vision

- International leading centre for Hydrochemical Process Technology (including Hydrometallurgy) where knowledge, education and research contributes to maximize utilization of raw materials and minimize energy consumption for critical elements

Goals And Strategies

- Increase cooperation and coordination between the three institutions
- Co-operation with industry and R&D Institutes/Universities in Norway and internationally
- Joint applications for Research Council projects
- Being and attractive partner in EU projects
- The Goal for the future will be to establish a Centre for Innovation-based Research (SFI)/ Centre of Excellence (SFF) within the area

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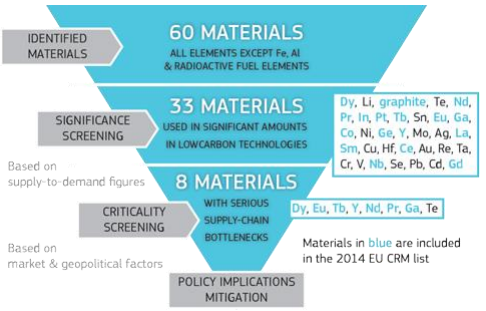
New opportunities for Hydrometallurgy

- Sustainability and Optimal resource utilisation
  - Circular economy
  - Focus on land fills, waste disposal sites
- Recycling of metals from solid waste and scrap (batteries, magnets, spent catalysts, solar cells, electronic products)
- Utilisation of low grade or complex ores
- Special focus on rare earth elements (REE) and other critical elements
- Treatment of drainage / pollutions from old mines / mine waste and tailings
- Recovery from concentrated or dilute waste streams



EU critical materials in Energy Technology

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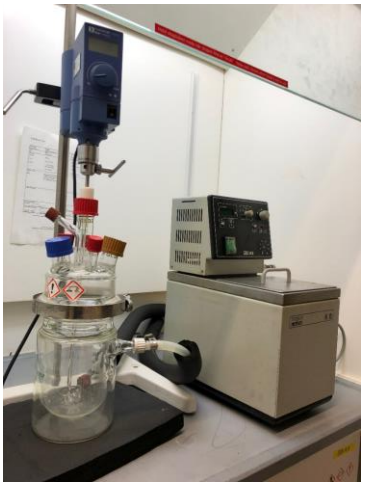
HyProS Gemini Centre Scientific Focus

- Solution based chemistry
- Leaching kinetics and mass transfer
- Separation methods
- Use of radioactive tracers
- Electrochemistry
- Process modelling and design
- Techno-economical evaluation
- Circular economy



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Added value of the HyProS Gemini centre

- Advance and coordinate the Norwegian Research Community to fulfil the HyProS vision
- Scientific coordination and education of new experts for industry
- Consolidating and developing expertise within the scientific focus areas
- Contribute to the goal of having at least 4 PhD candidates (2 at UiO and 2 at NTNU)
- Natural point of contact for Industry within the Hydrometallurgy Network
- Realize more direct Industry Projects, Research Council Projects and EU Projects
- Become a more attractive partner for EU-projects and in time be able to establish and coordinate EU-projects.

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Existing Activities with basis in HyProS

- Cooperation between the partners
  - The Norwegian Hydrometallurgy Network (Process industry) – established spring 2018
  - Hydromet, competence project funded by the Research Council (2014-2018)
  - PRICE, competence project funded by the Research Council (2019-2013)
- Relevant activities at partners
  - UiO – Center of the biogeochemistry of the Anthropocene (CBA)
  - NTNU is partner in LIBRES IPN (Li recovery from car batteries)
- EU projects

removAL
removing waste from alumina production

ENSUREAL
SUSTAINABLE ALUMINA PRODUCTION

SeCREEts
Secure European Critical Rare Earth Elements

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Teknologi for et bedre samfunn