



THE NORTHERNMOST UNIVERSITY
of Technology in Scandinavia



cobalt

Raw material scarcity in Europe: stakeholder collaboration to achieve a transparent & accountable supply chain

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Raw materials scarcity

- Dimensions of managing scarcity:

→ Functioning of the market
(match of supply-production-demand)



→ Functioning of politics (trade barriers, export disruptions, conflicts)

- Mitigating scarcity of minerals and metals

- More efficient extraction and processing
- More efficient use in applications
- Recycling of minerals and metals
- Substitution

→ Availability of resources/stock

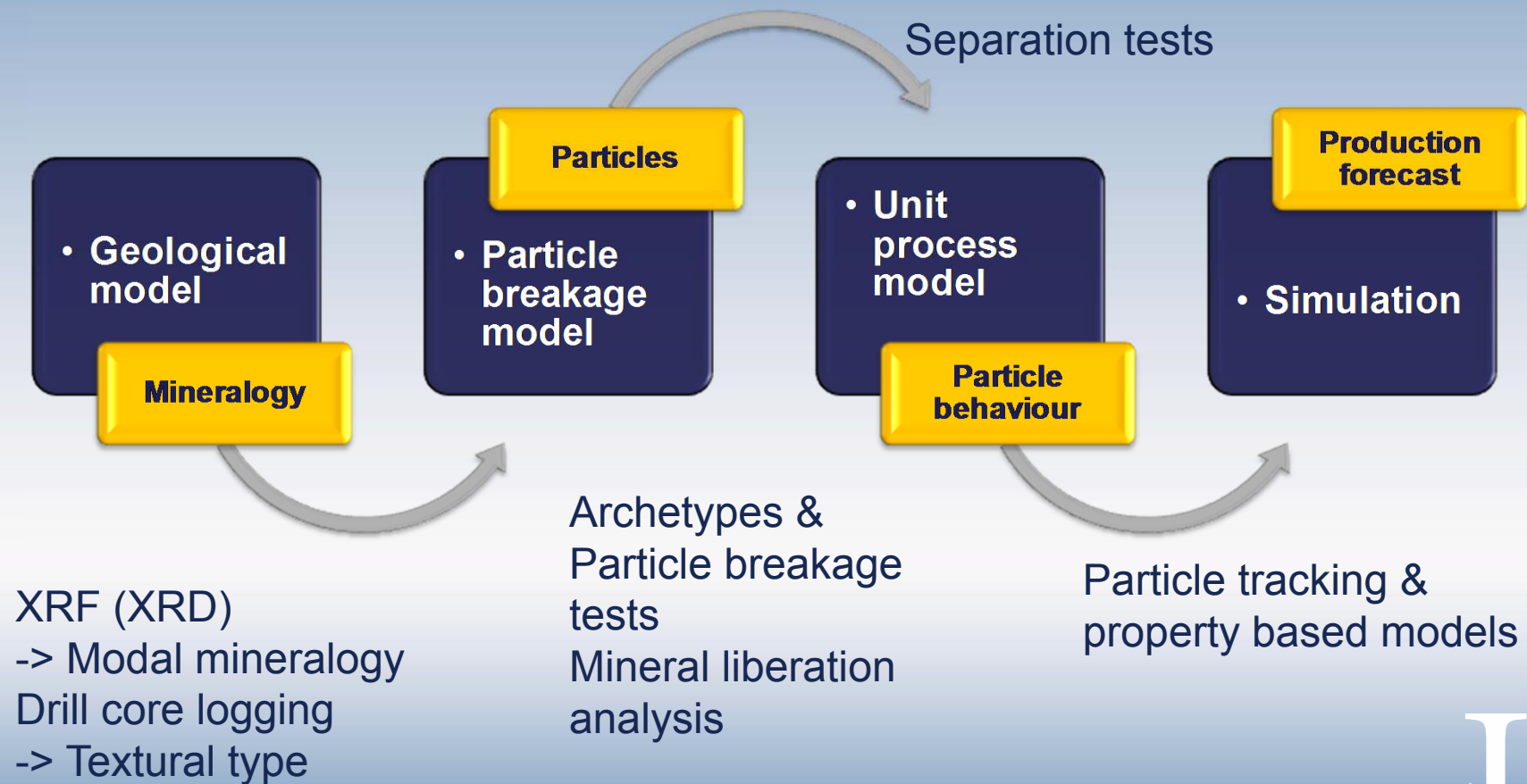


Resource efficiency in processing

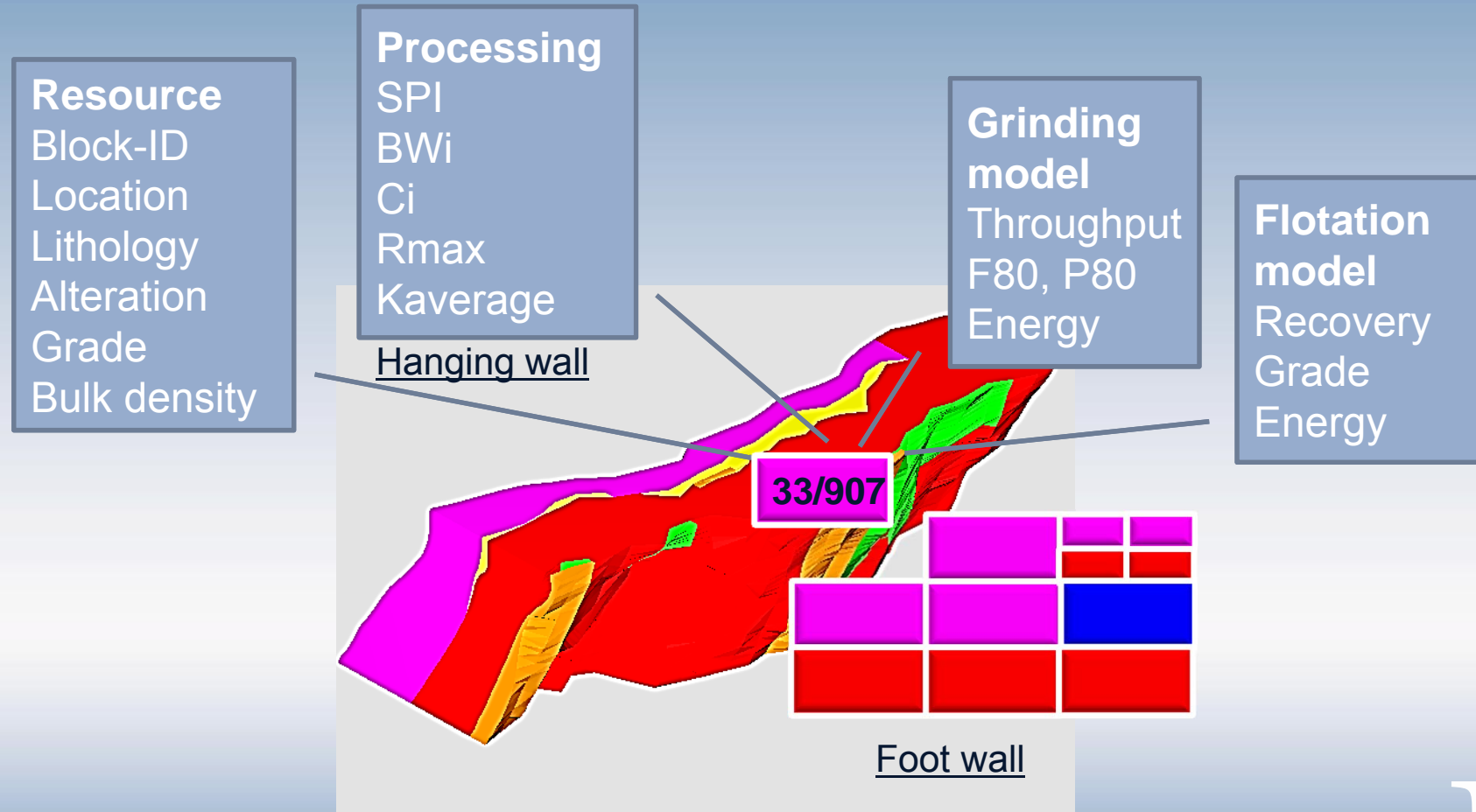
- Optimal use and management of minerals and resources
 - Husbanding with primary natural resources
 - Reduced water and energy use/ footprint
 - Reduction of comminution consumables
 - Prevention of material losses and emissions
 - Recycling / closing the loops
- Approaches
 - Material characterisation
 - (Automated) process mineralogy
 - Unit operations
 - Alternative comminution technologies
 - Coarse and fine particle processing
 - Sensor-based sorting
 - System approach
 - More complex flow sheets
 - Process modelling and simulation
 - Geometallurgy



Geometallurgical modelling



Geomet block model



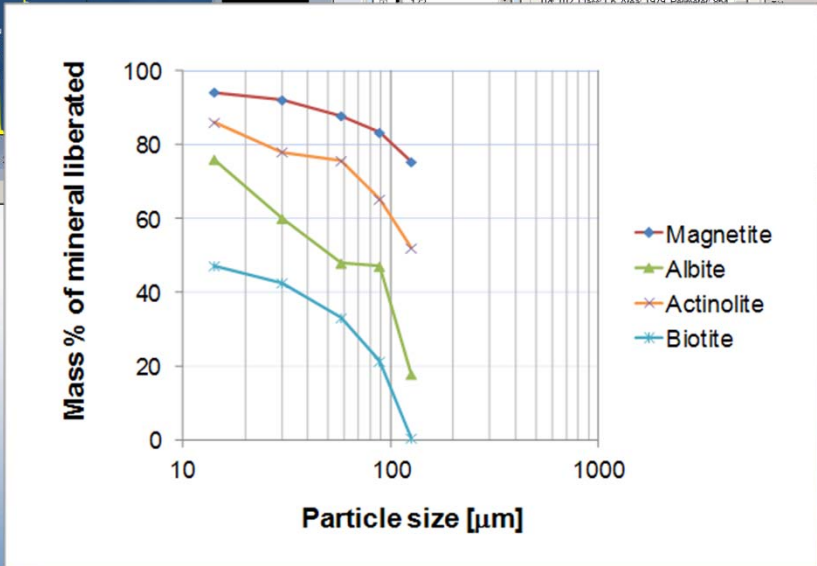
Automated mineralogy

The image displays two software windows. The left window, 'INCA - Feature', shows a workflow menu on the left and a 'Review Features' table in the center. The right window, 'InGrAnalyze', shows a list of features on the left, a central image of a mineral grain, and a 'Details' panel on the right with a pie chart and statistical data.

Feature	Rank	Field	Area
233	1	4	Kosp106
234	1	4	Kosp106
235	1	4	Kosp106
236	1	4	Kosp106
237	1	4	Kosp106
238	1	4	Kosp106
239	1	4	Kosp106
240	1	4	Kosp106
241	1	4	Kosp106
242	1	4	Kosp106
243	1	4	Kosp106

Name	Value	Units
Area	1367.75	sq.µm
Aspect Ratio	1.39	
Beam X	987.00	pixels
Beam Y	162.50	pixels
Breadth	49.04	µm
Direction	23.99	degrees
ECD	41.73	µm
Length	68.14	µm
Perimeter	245.42	µm
Shape	3.50	

Class	Area	Perimeter	Length	Breadth	Direction	ECD	Length	Perimeter	Shape
Id: 101	438	137	78	78	2				
Id: 102	137	78	78	78	2				





Supply chain transparency

- Origin of the products
 - System (process) → Complexity
 - Sources (material) → Number
- Who is demanding
 - Consumers
 - Government
 - Companies
- Concerns
 - Quality
 - Safety
 - Ethics
 - Environmental impact
- Conflict minerals:
 - US Customer Protection Act (2010)
 - Disclosure of the supply chain: audits, assessments, reports
 - Tracing: Focus on smelters