



Wise process routes for varying feedstock in base metal extraction

VINNOVA

Boliden Mineral AB

LKAB

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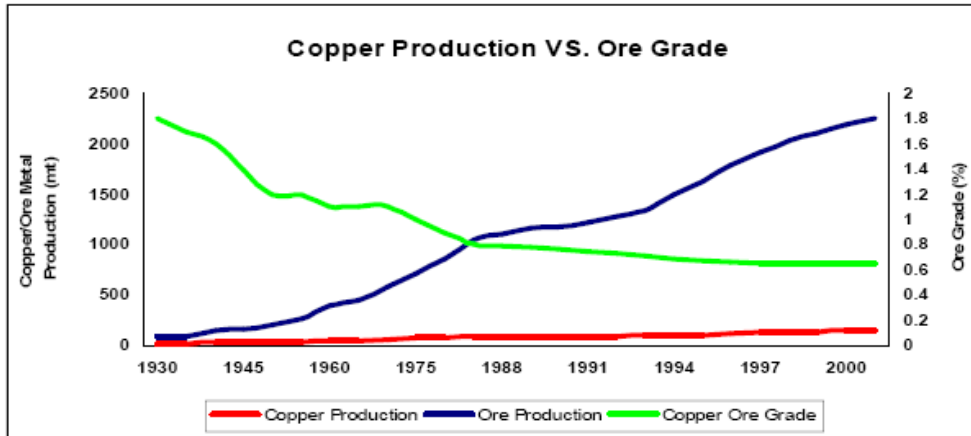
Division of Extractive Metallurgy, LTU





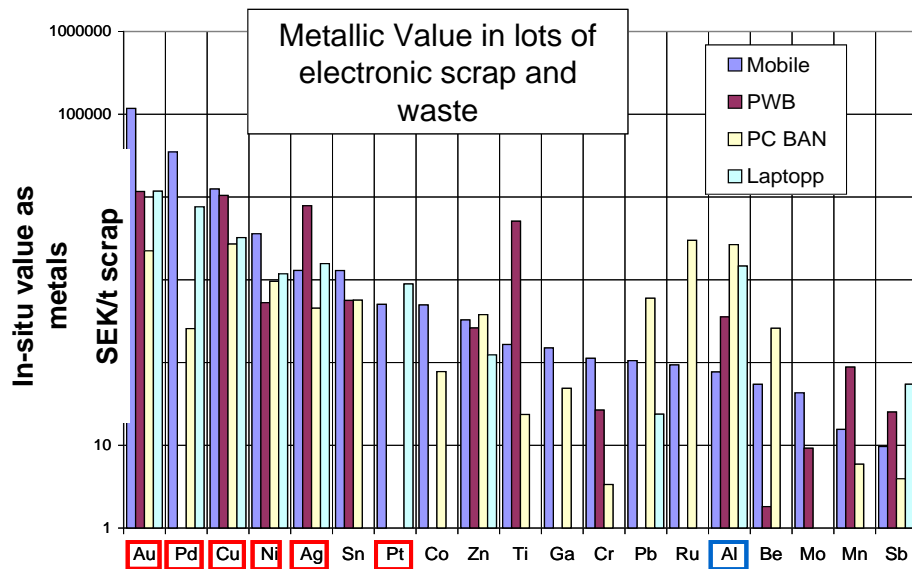
Aim

- Predict consequences of changing raw material base, primary/secondary on the metal extraction chain
 - Complex and impurity rich mineralizations
 - Efficient use of secondary raw materials
 - Network



Source: Raw Materials Group, Stockholm

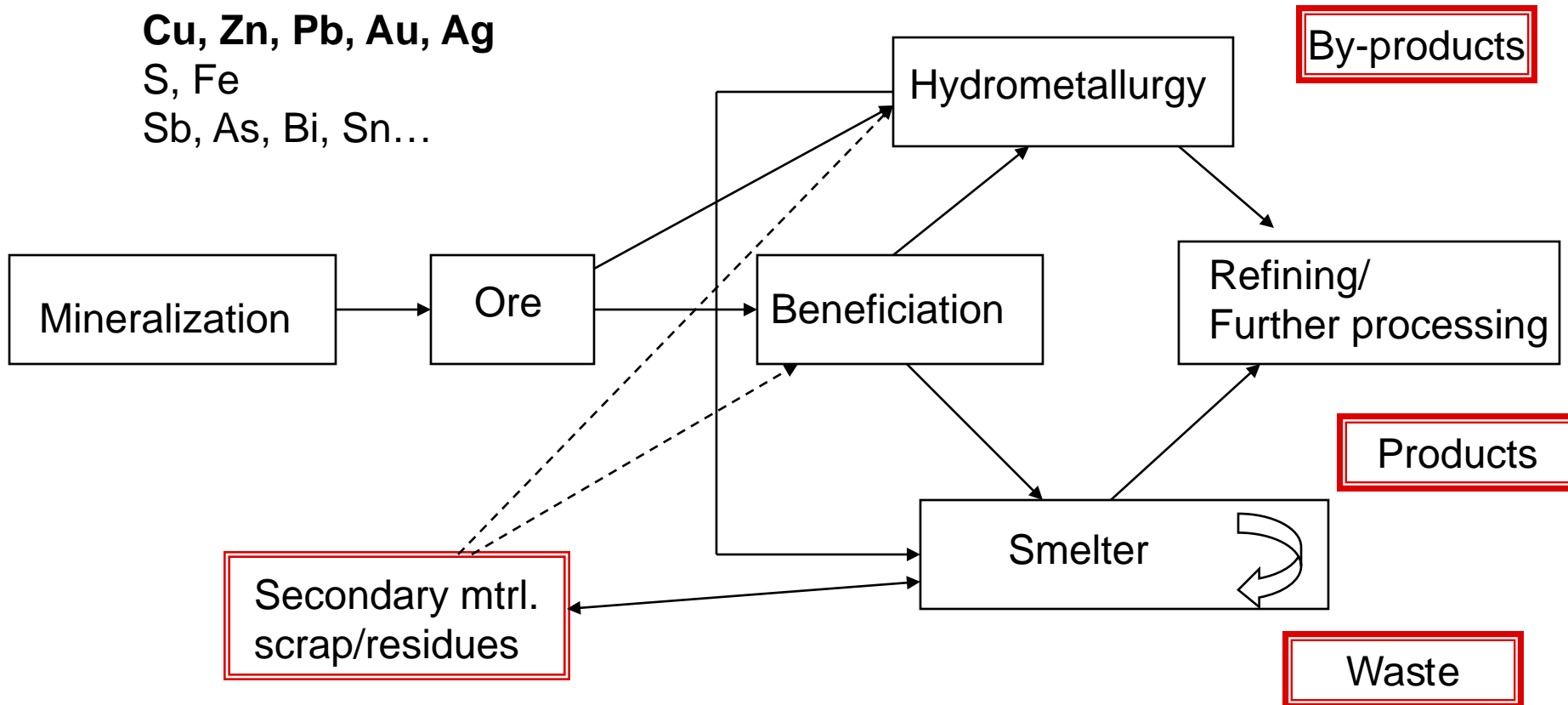
Lower grade ores (e.g. As content)
Secondary raw materials (varying and complex composition)





Wise process route

Cu, Zn, Pb, Au, Ag
S, Fe
Sb, As, Bi, Sn...





WP 1

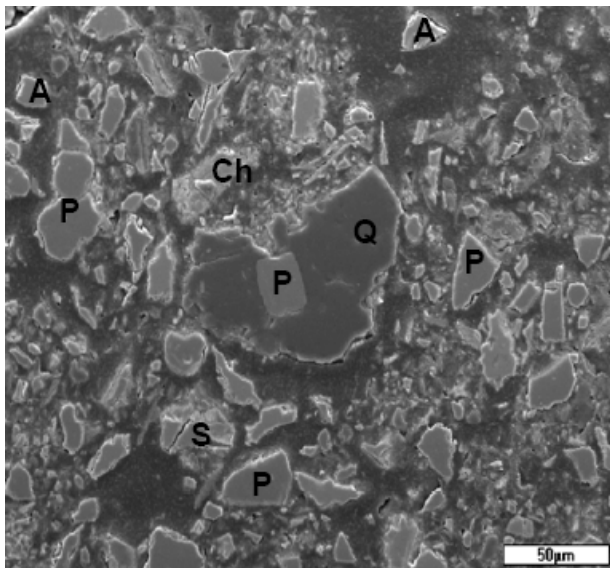
Impurity management and valorisation

- **Hydrometallurgical pretreatment**
 - Test material; complex concentrates, smelter residues
 - Hitherto focus on Sb
 - Leaching studies of complex concentrate
 - Fundamental studies on leaching of Sb-minerals
 - Electrowinning
 - Evaluation of hydrometallurgical treatment for other elements



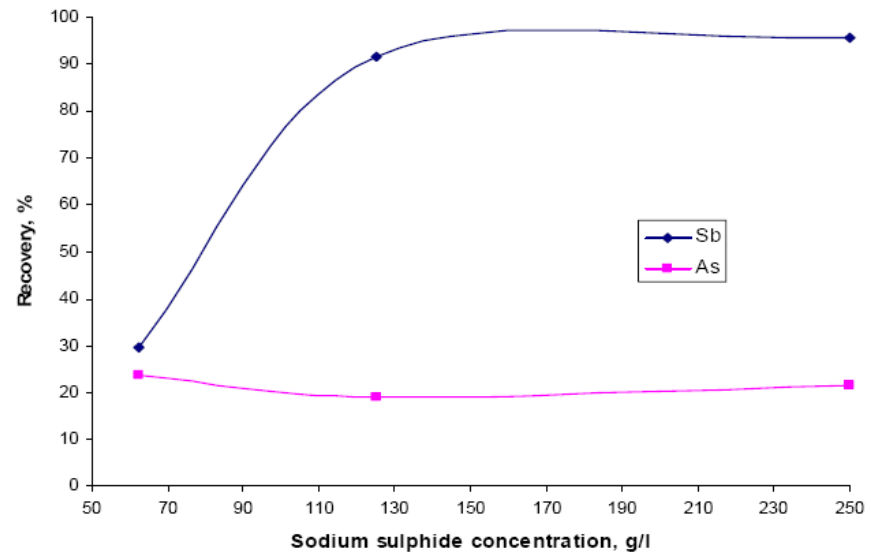
Studies of Maurliden västra and Petiknäs norra

- Characterisation



Sb in the form of tetrahedrite (Maurliden västra)

- Leaching test; alkaline sulphide solution proved selective to Sb





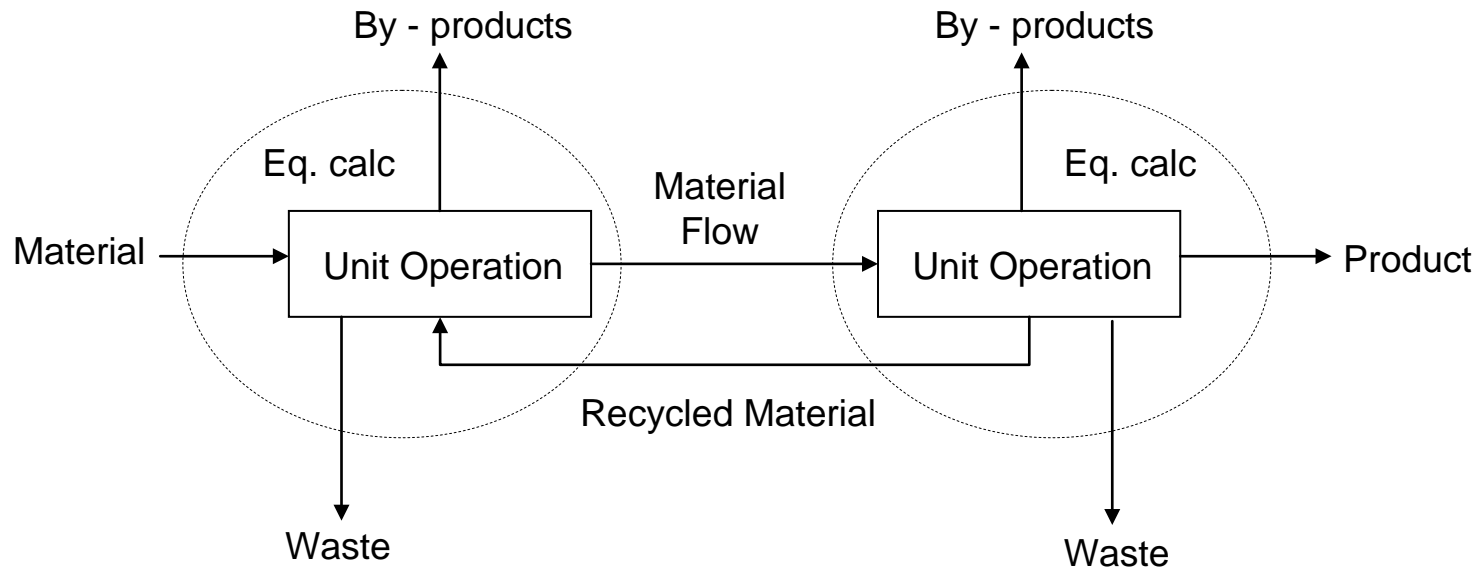
WP 2

Impact of impurities on extraction, smelting and refining processes

- Impurity distribution in smelting
 - Focus on thermodynamics
 - Evaluation of existing data
 - Develop models /determine data
 - Plant data; sampling and characterisation
- Impurity capacity
 - Focus on experimental studies in bench scale
 - Slag properties; impact of impurities; Al
 - Recycling of secondary mtrl. (CRT/LCD); impact on slag properties



Thermodynamic calculations; impurity distribution of minor and micro elements



–Literature survey; thermodynamic data for microelements is lacking





Slag capacity

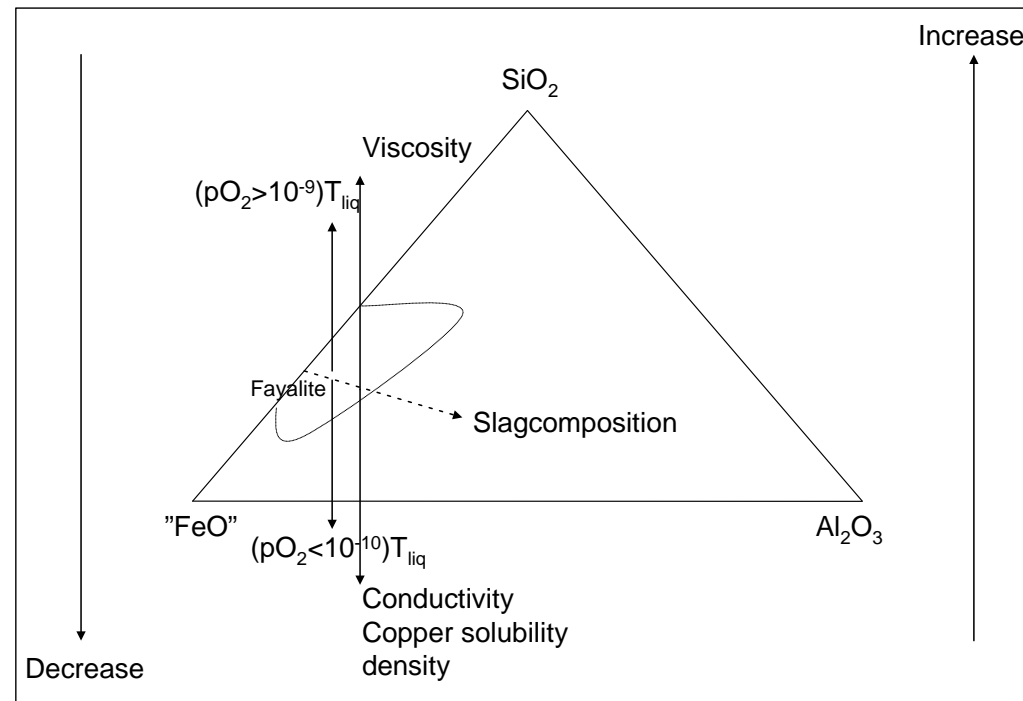
•Recycling of CRT

- Mineralogy: above 10% addition to slag, a glassy structure identified

•Impact of increased Al

- Mineralogy: Addition of 10% Al_2O_3
 - new phase formed,
 - Spinell composition changes
- Melting
 - Stepwise melting
 - Increased liq. temp
- Leaching
 - no significant changes

Literature survey; alumina





WP 3 Evaluation of process options

- Selection of raw materials
 - Complex mineralizations (Maurliden, Rockliden)
 - Secondary materials
- Tools for modelling
 - SimuLink, SimuSage
- Collection of data
 - Literature survey (WP2)

**Resources should be used with wisdom and knowledge
to give the future generations worldwide
wealth in a healthy environment**

**Yet : ... Knowledge is about the past,
Wisdom is about the Future.**

American Indian Chieftain