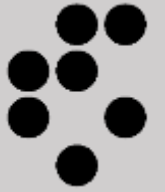


Exploitation of secondary raw materials: A chemist's perspective



Dr. Gašper Tavčar
Jožef Stefan Institute

Pros and cons – why do it at all?



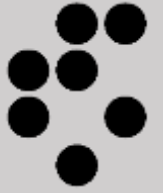
PROS

- No excavation required
- Grinding not or just partially necessary
- Easier to evaluate the stocks
- Remediation

CONS

- Concentrations usually lower than in ore
- Neutralization often required
- Vitrification in slag
- Major elements often suppress the extraction of REE

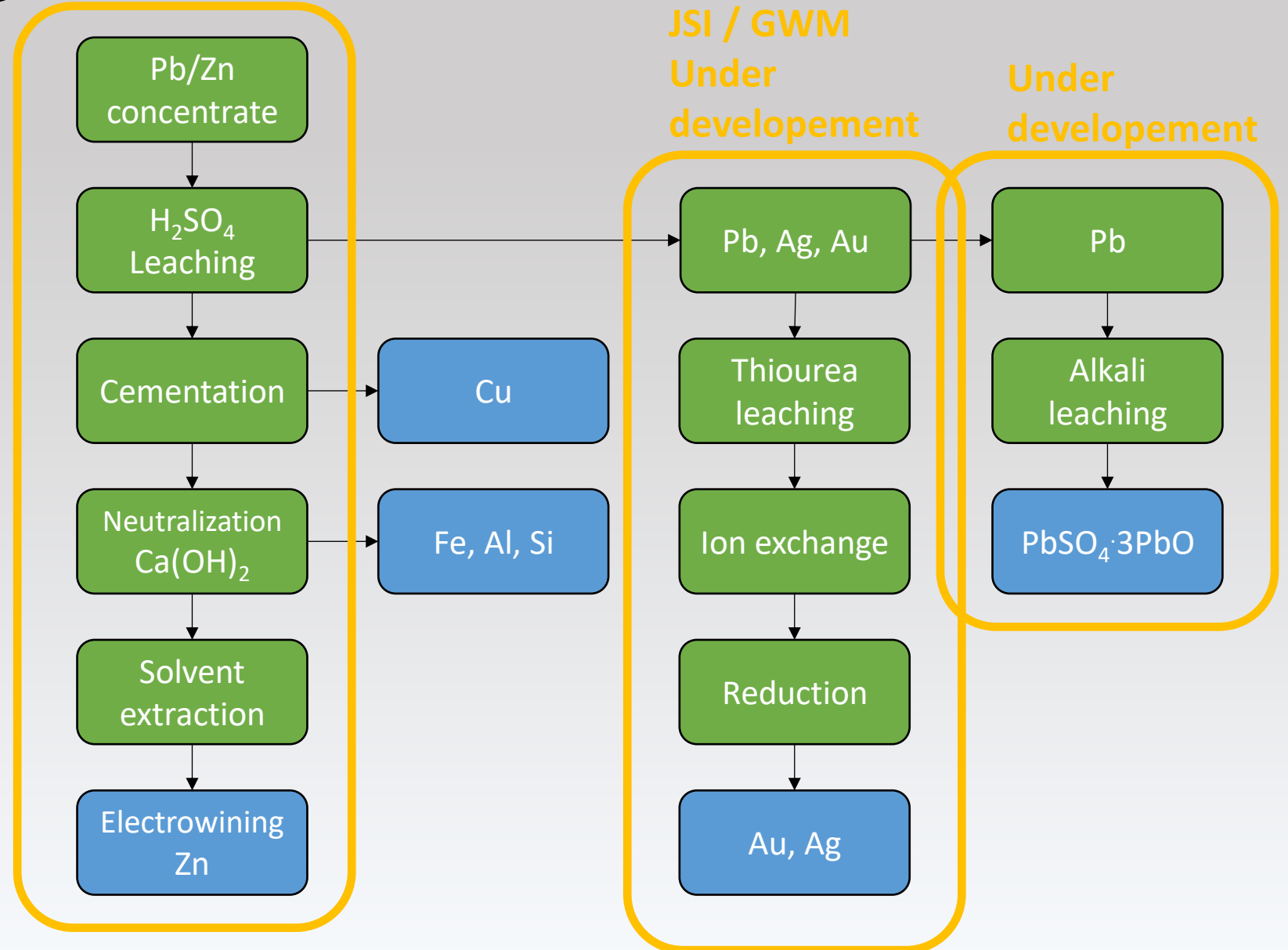
Application of chemical methods to secondary raw materials



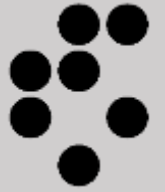
- Different mineral composition than ores
- Different elements present due to the previously used processes
- Composition is often changed by the reactions with oxygen or CO_2
- New or adapted methods have to be introduced
- Additional steps to extract as many resources as economically reasonable are required

Utilization of new technologies for the reprocessing of the Pb tailings

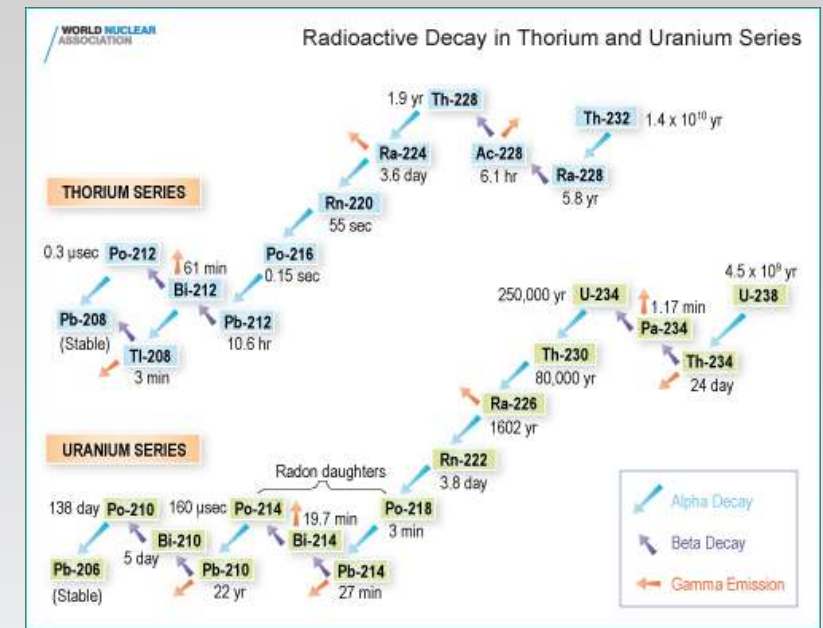
Scorpion mine



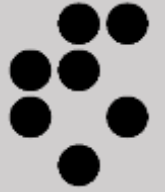
Major problem - NORM



- Natural occurring radioactive materials-NORM
- U-238 and Th-232 decay series
- Industries known to have NORM issues:
 - The coal industry (mining and combustion)
 - The oil and gas industry (production)
 - Metal mining and smelting
 - Mineral sands (rare earth minerals, titanium and zirconium).
 - Fertilizer industry (phosphate)
 - Building industry
 - Recycling

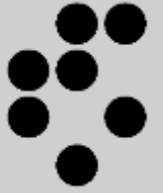


Major problem - NORM



	U – series [Bq/kg]	Th – series [Bq/kg]
Soil (world average)	40 (2 ppm)	43 (5 ppm)
Coal (USA)	6-73 (3 ppm)	4-21 (3 ppm)
Coal Ash (USA)	100-600 (24 ppm)	30-300 (40 ppm)
Coal (Hungary)	20-480 (19 ppm)	-
Coal Ash (Hungary)	200-2000 (79 ppm)	76-170 (10 ppm)
Ore	70-250 (10 ppm)	40-600 (70 ppm)
Heavy mineral concentrate	<250-1700 (70 ppm)	600-6600 (800 ppm)
Processing tailings	250-25,000 (1000 ppm)	1500-50,000 (6000 ppm)
Uranium ore (cut off grade)	25,000 (1000 ppm)	

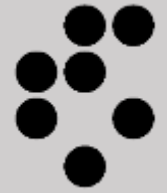




Major problem - NORM

- Lack of harmonization of national approaches to the management of NORM residues
- IAEA Exemption level 10 Bq/g
- Acceptance of the need to minimize NORM waste by recycling NORM residues or using them as by-products (with dilution if necessary) is required

Acknowledgement



Industrial partners

