



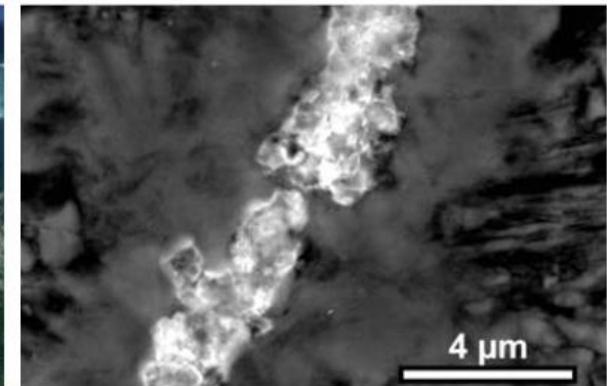
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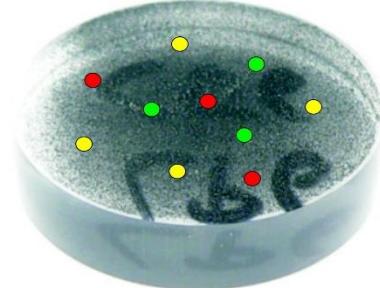
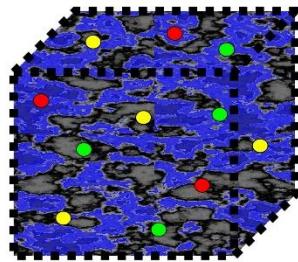
# Understanding element anomalies using Quantitative Target Mineralogy (QanTmin)

Thomas Aiglsperger  
Applied Geochemistry  
LTU

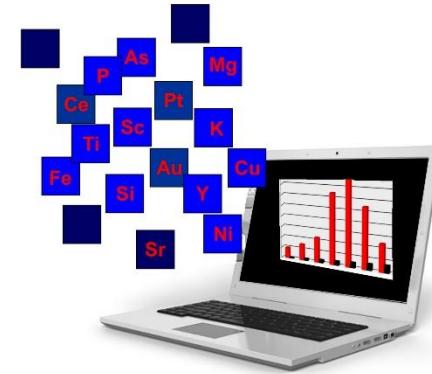
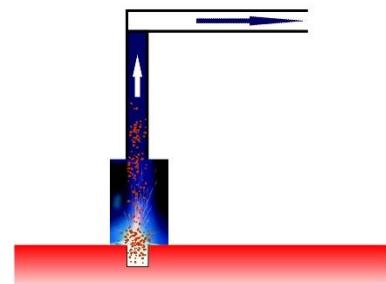
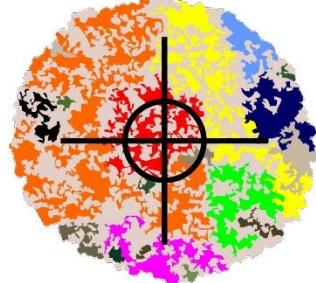




## The QanTmin approach



① Sample → ② Hydroseparation → ③ Monolayer



④ Automated  
Mineralogy

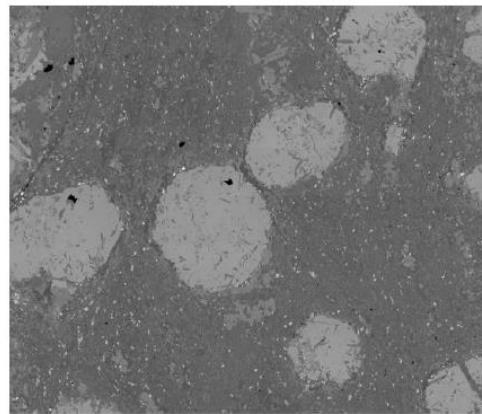
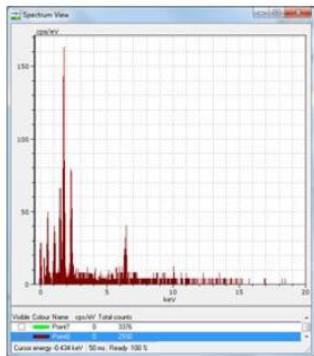
⑤ Automated  
LA-ICP-MS

⑥ & ⑦ Advanced  
Analyses & Interpretation



# MINERALOGIC from ZEISS

## EDS Spectrum



## Quantify

O	42.36
Fe	28.43
Si	13.69
Mg	7.4
Al	8.12

## Employ element ratios

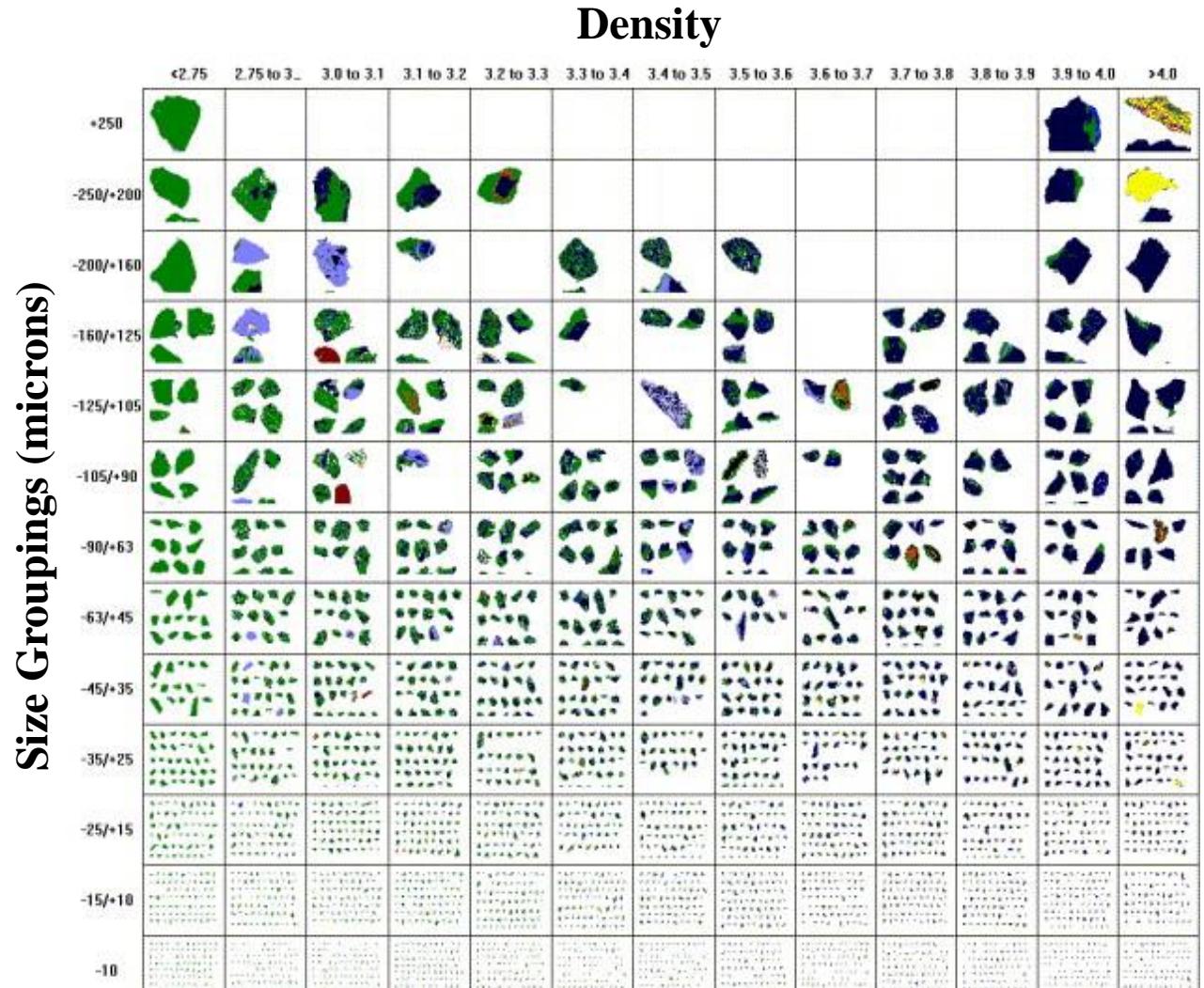
$\frac{Fe}{Mg} > 1$  Chamosite

$\frac{Mg}{Fe} > 1$  Clinochlore



## Detailed Information:

- Mineralogy and chemical composition of minerals
- Grain size, shape, liberation analysis
- Sample properties (including porosity)
- Correlation using mineral and chemical data
- etc.



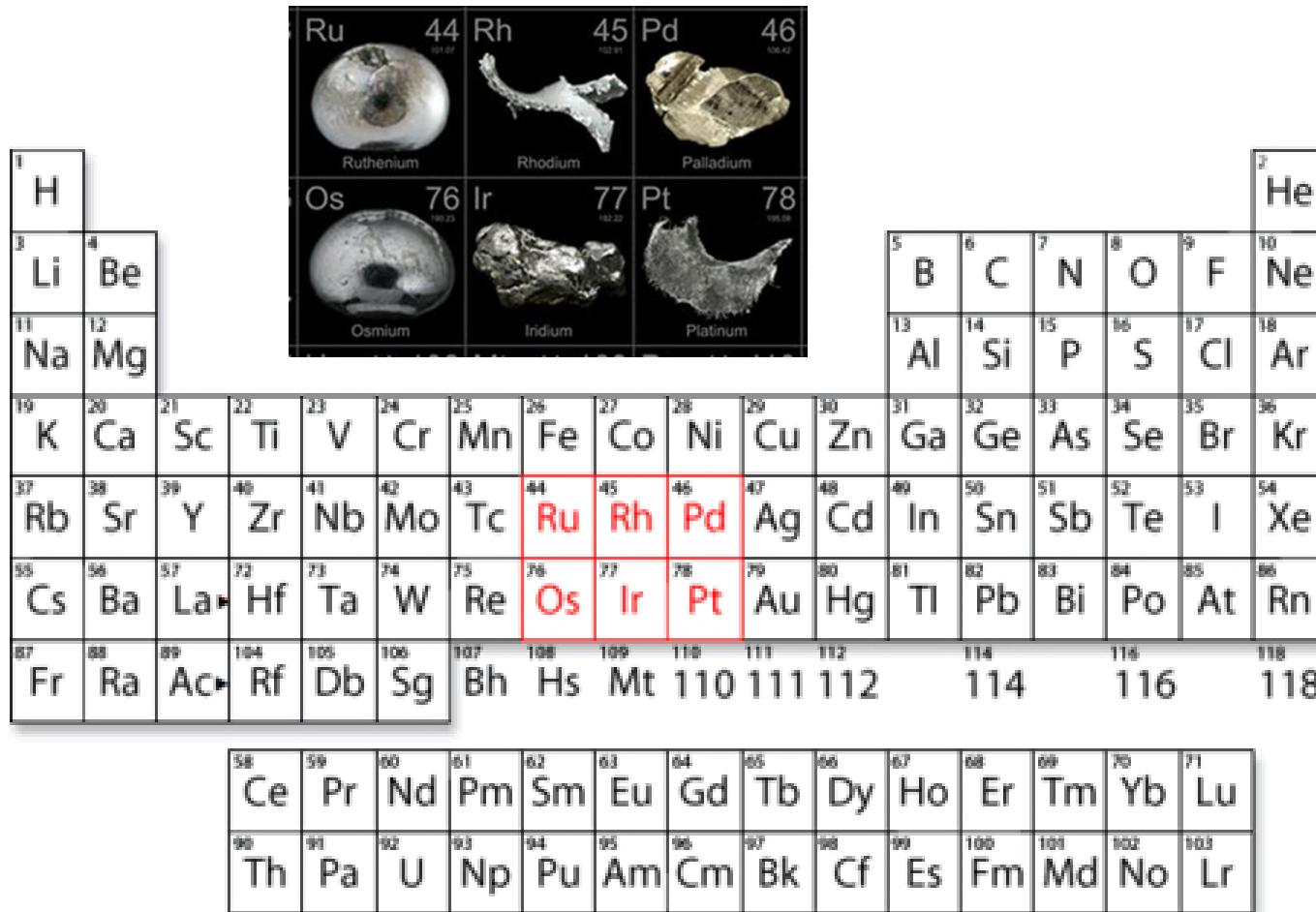
Pascoe et al. (2008)

# Understanding element anomalies using QanTmin: The example of PGE in Ni-laterites



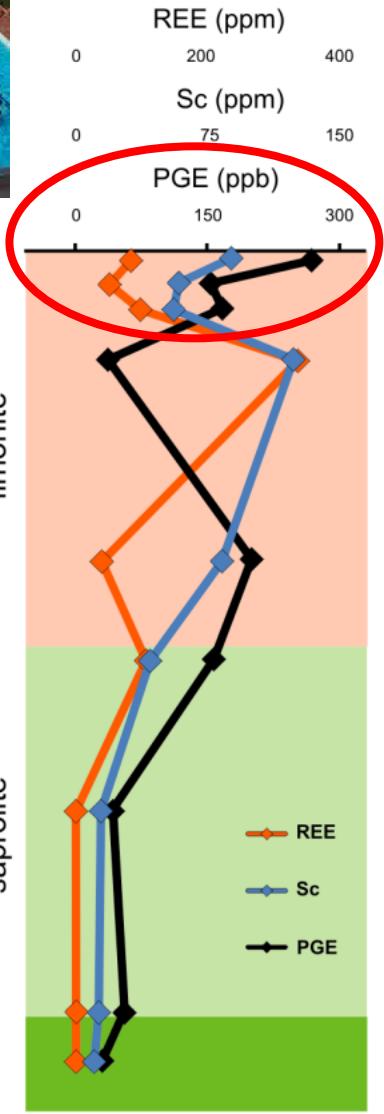
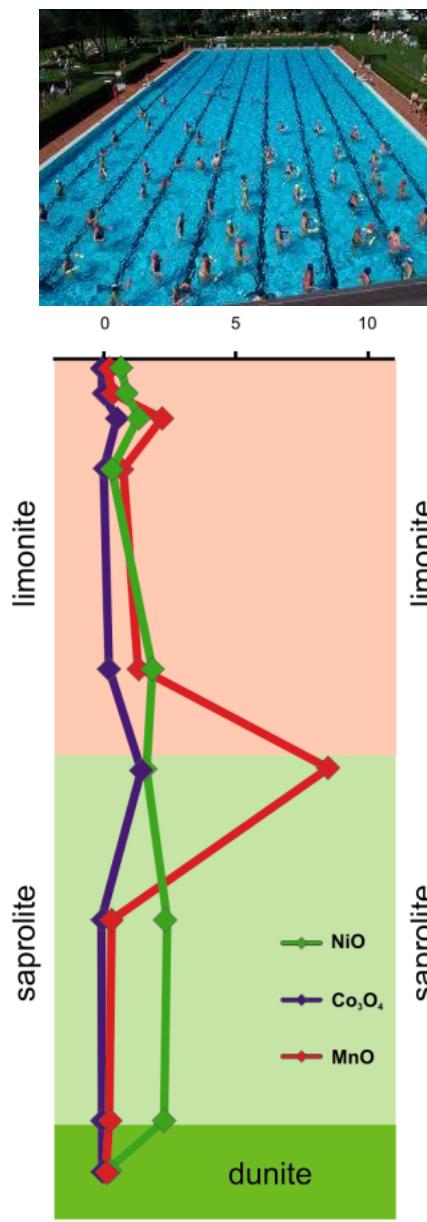
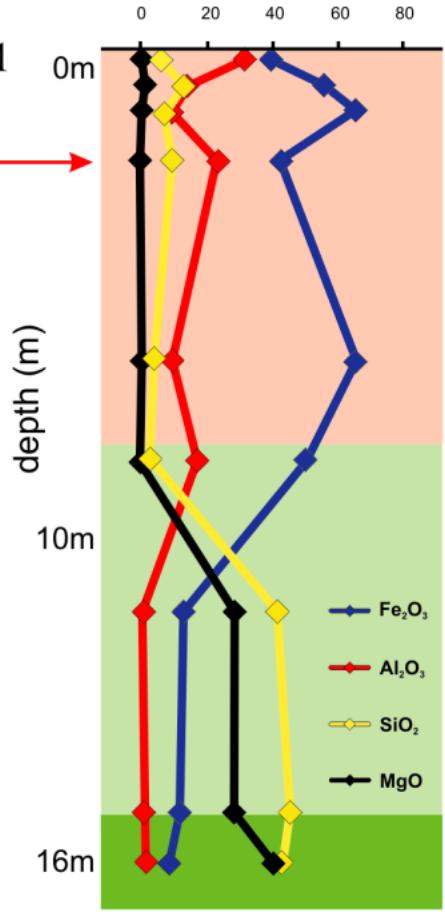
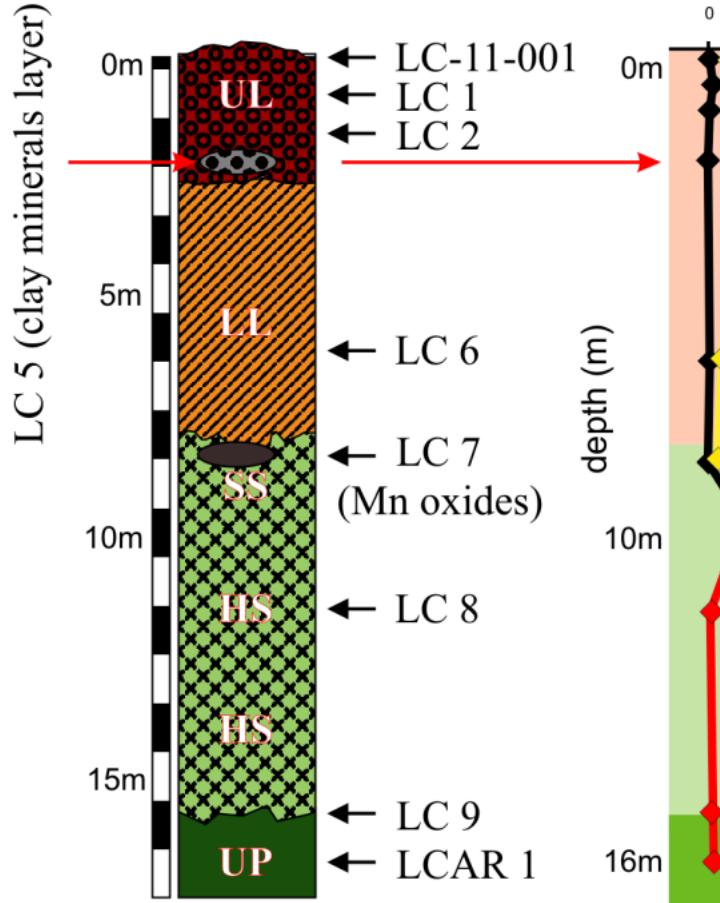
# Platinum Group Elements (PGE)

## „High-tech metals“

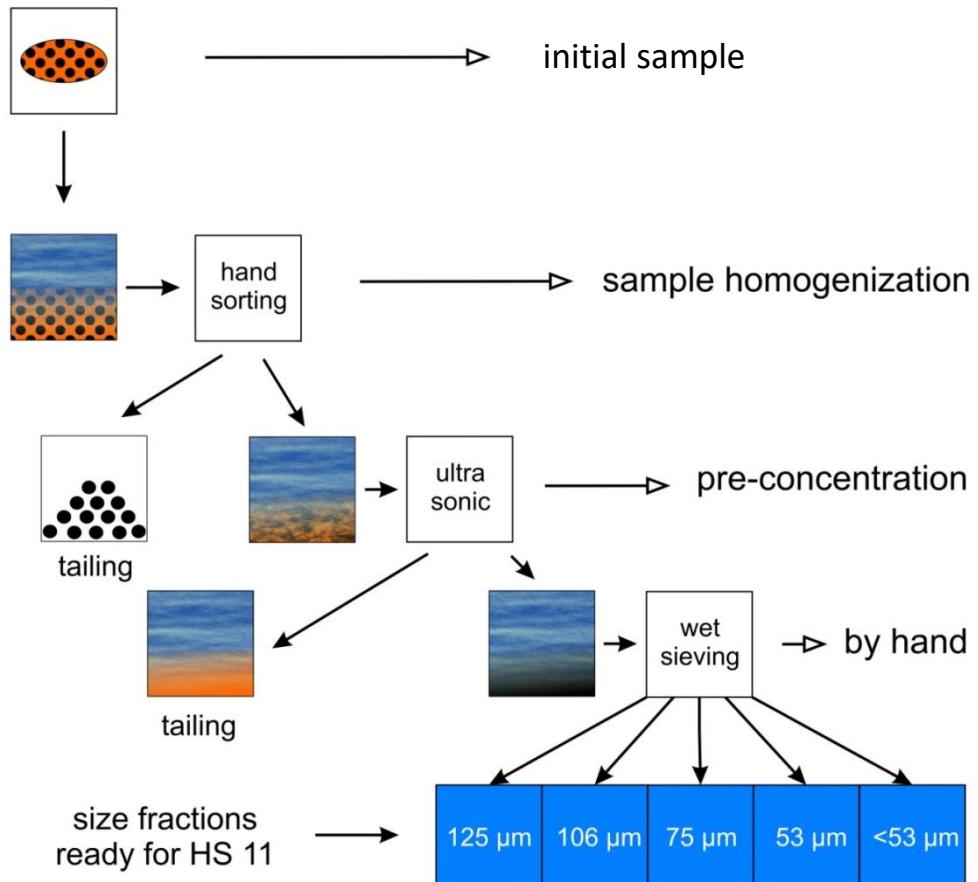




## (Falcondo)



## HYDROSEPARATION



*Aiglsperger et al. (2015)*



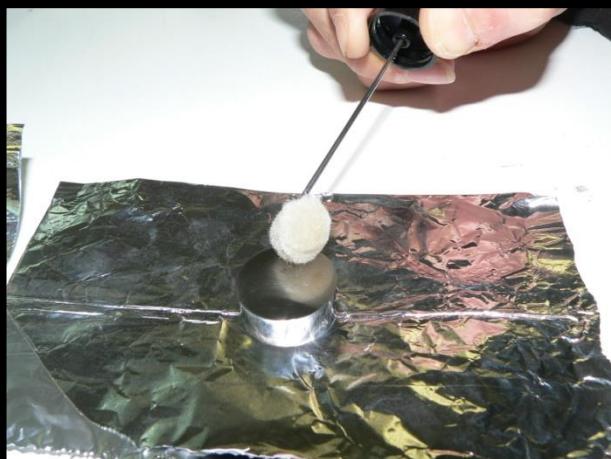
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heavy mineral hydroseparation



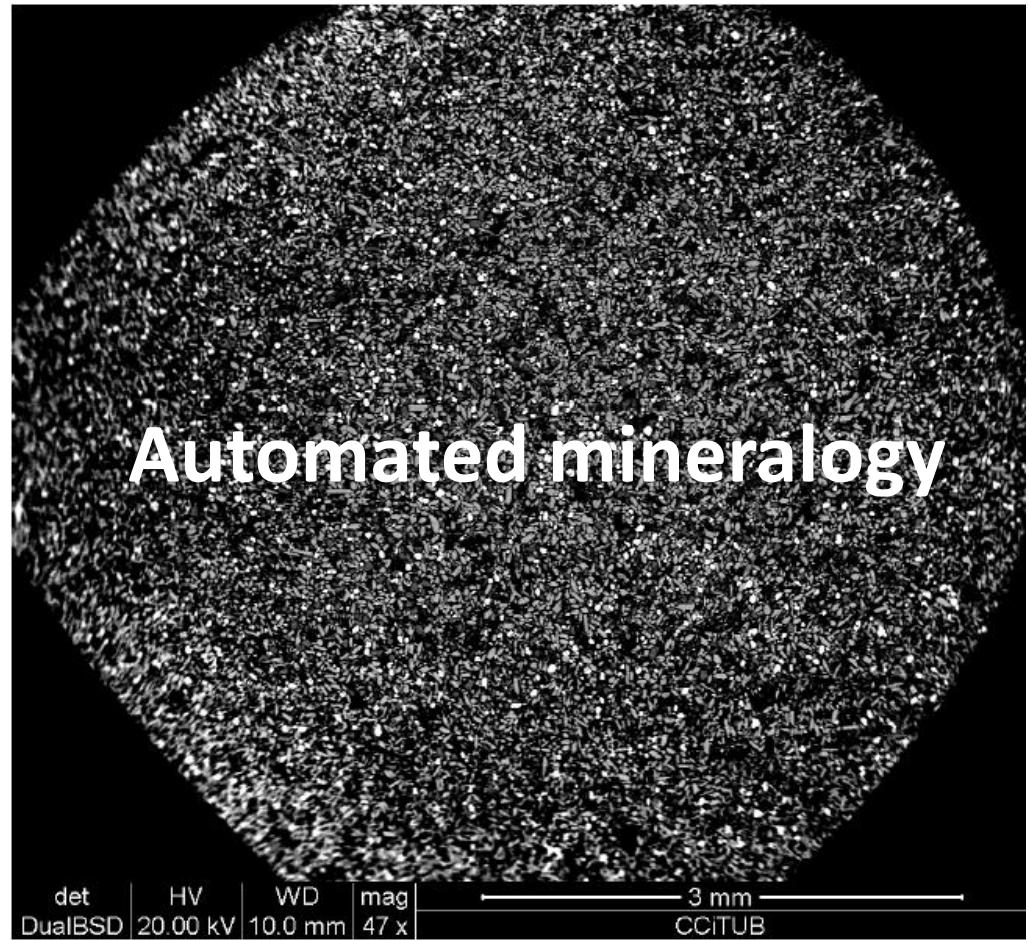
# monolayer preparation





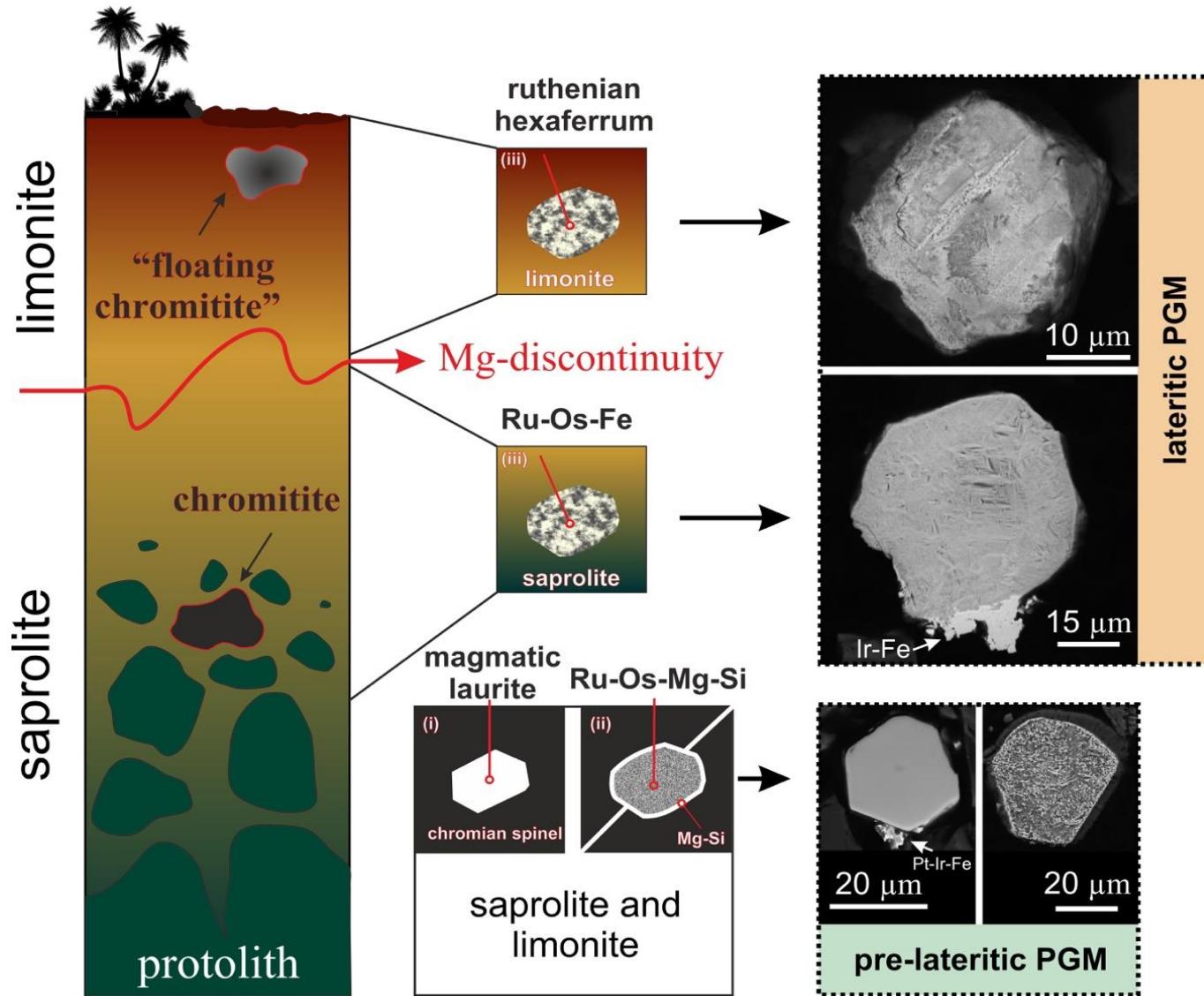
d=2.5 cm

>100 000 grains!



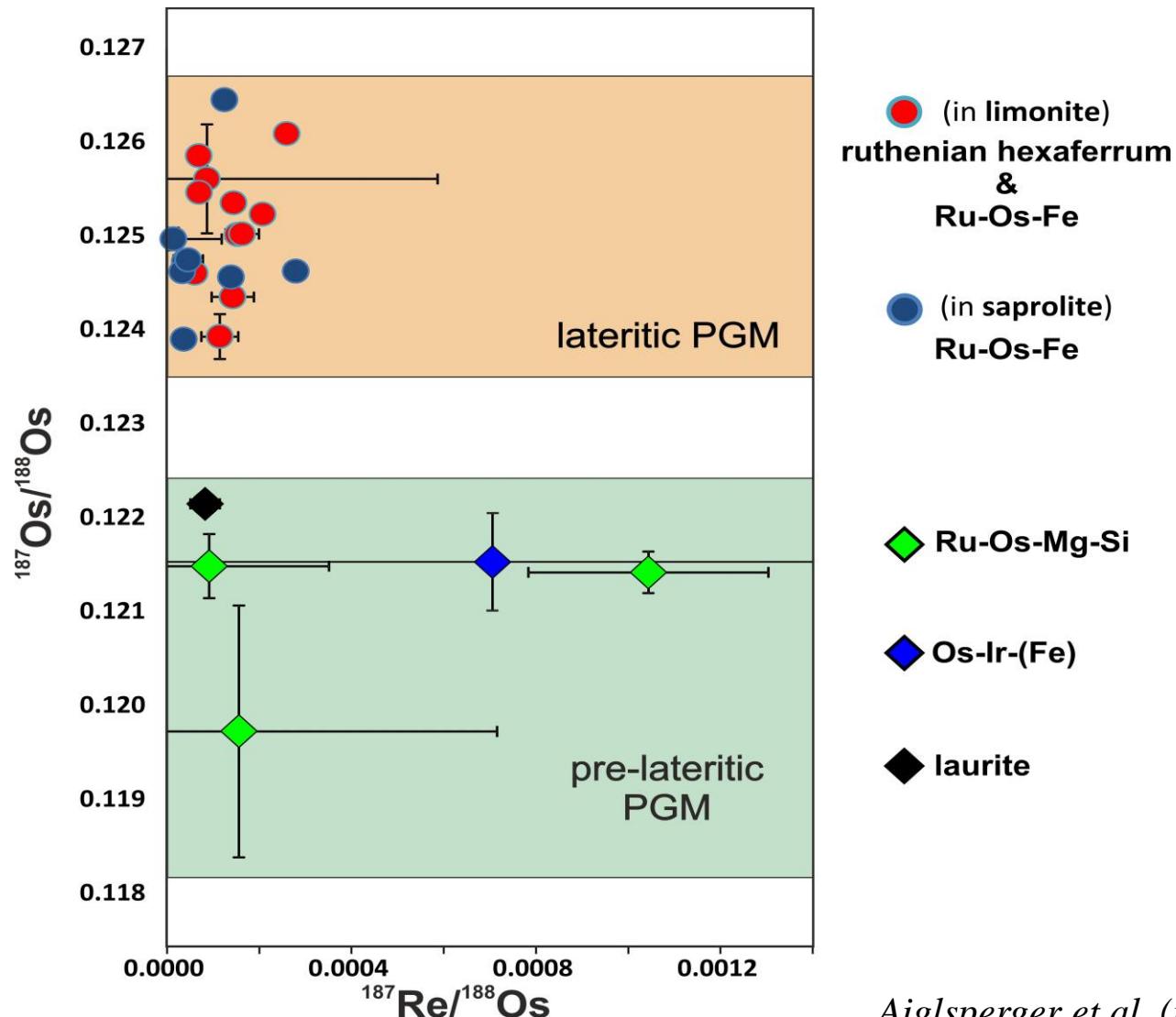


## primary & secondary PGM





# Open System Re-Os Isotope Behaviour in platinum-group minerals during laterization?





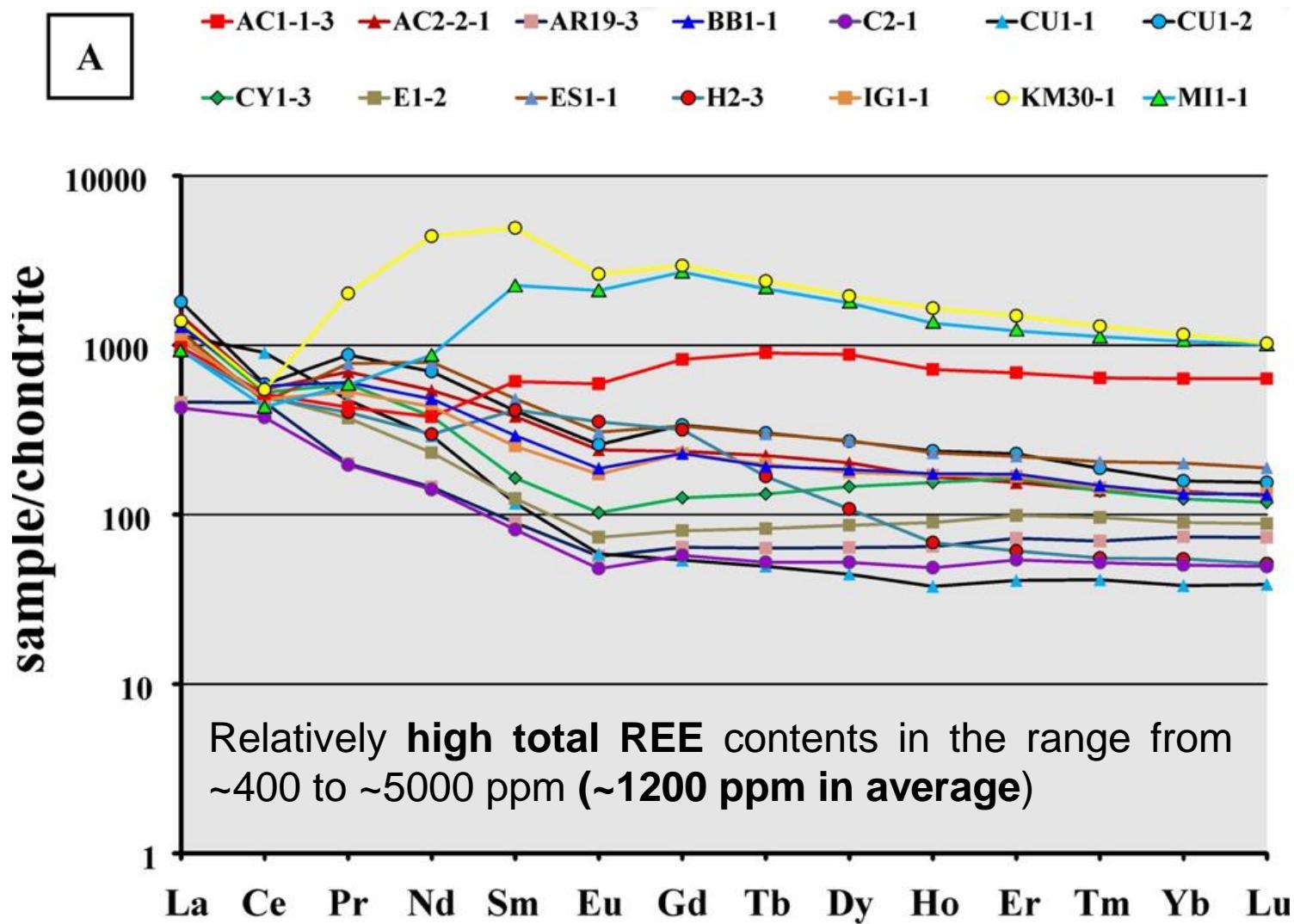
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# Mineral speciation of REE in bauxite ores from the Dom. Rep.

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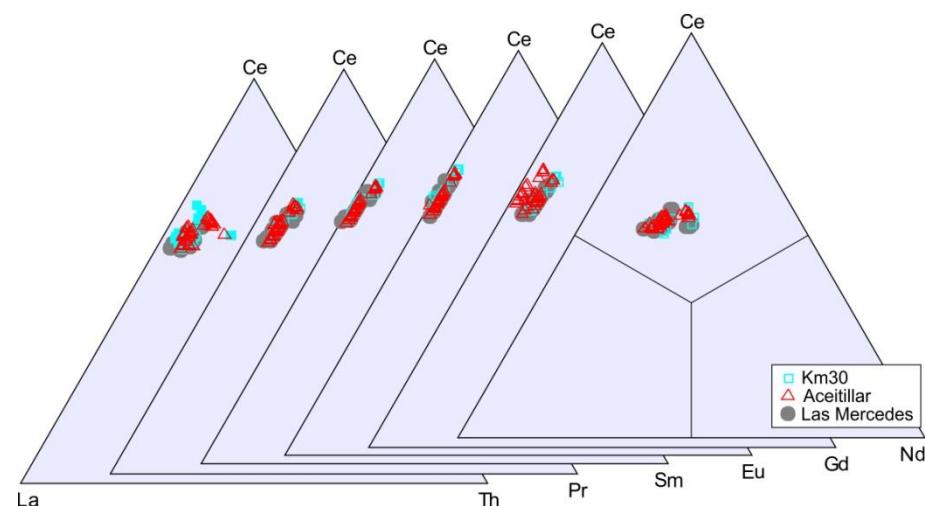
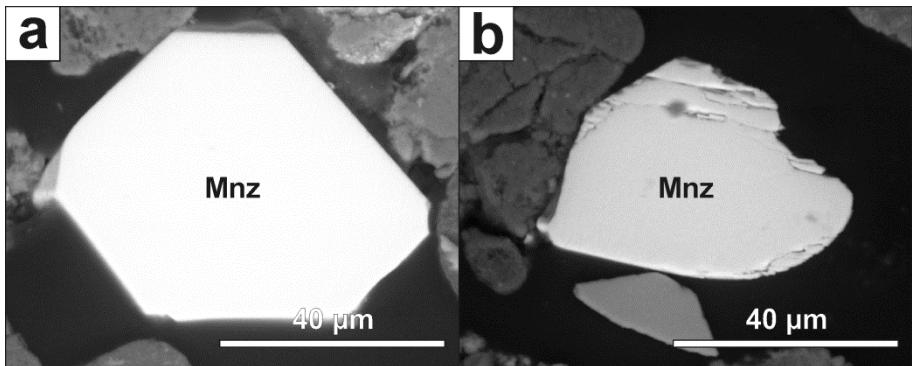


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BARCELONA



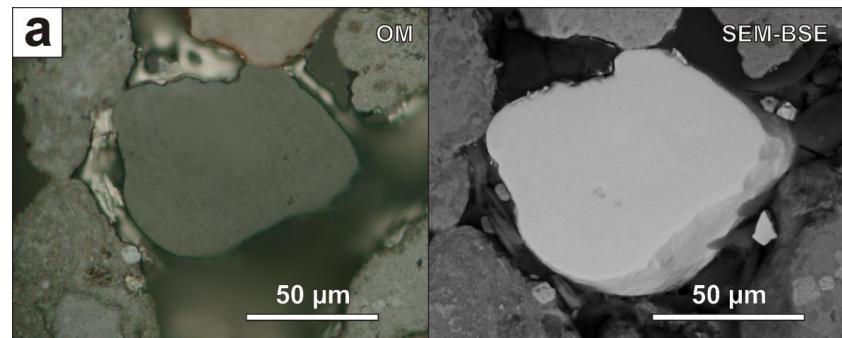
## Using the QanTmin approach

- Primary REE minerals (monazite)

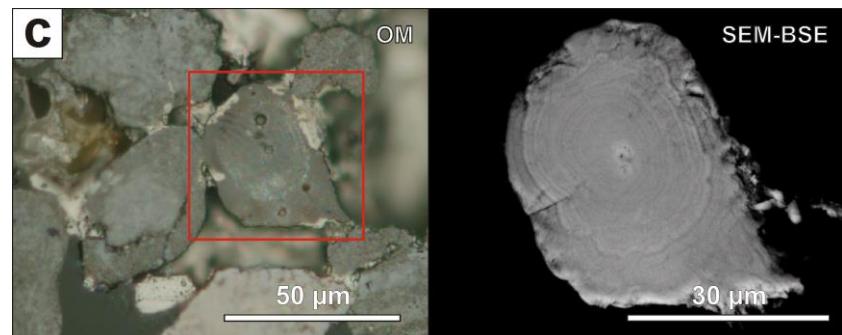


- Secondary REE minerals

REE phosphates (50 grains)

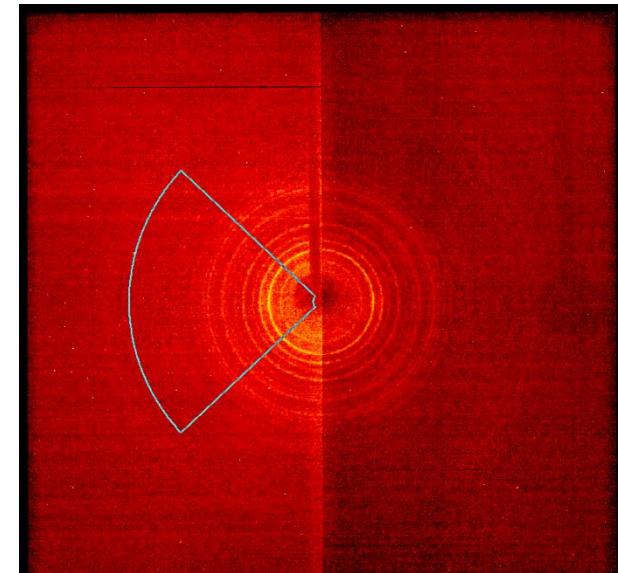
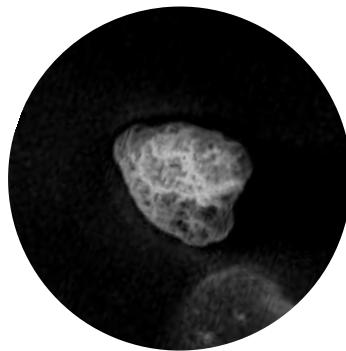
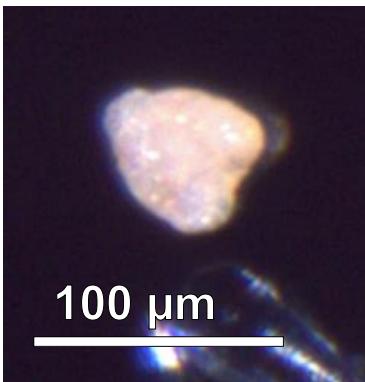


REE carbonates (58 grains)



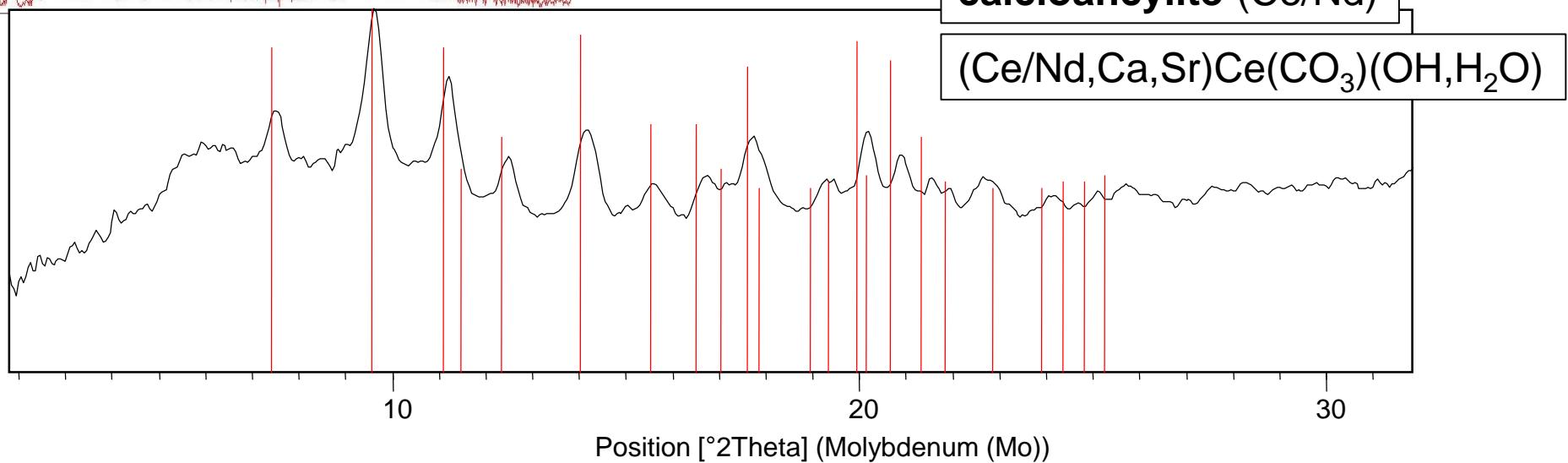


# Single Crystal XRD



calcioancylite-(Ce/Nd)

$(\text{Ce}/\text{Nd}, \text{Ca}, \text{Sr})\text{Ce}(\text{CO}_3)(\text{OH}, \text{H}_2\text{O})$

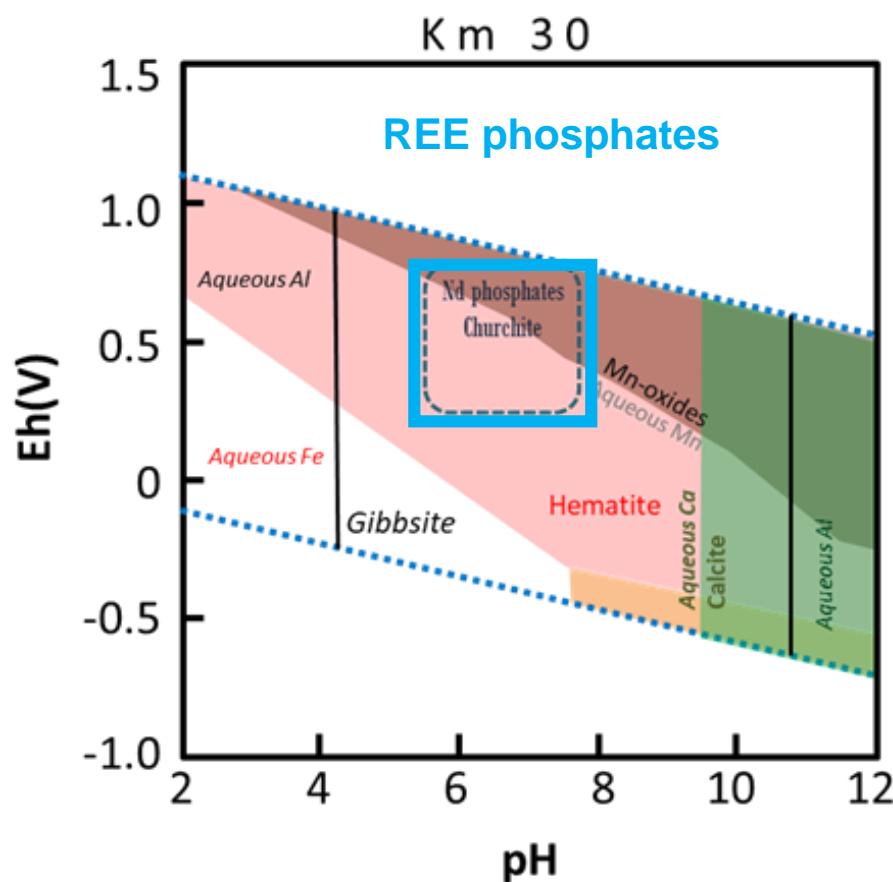
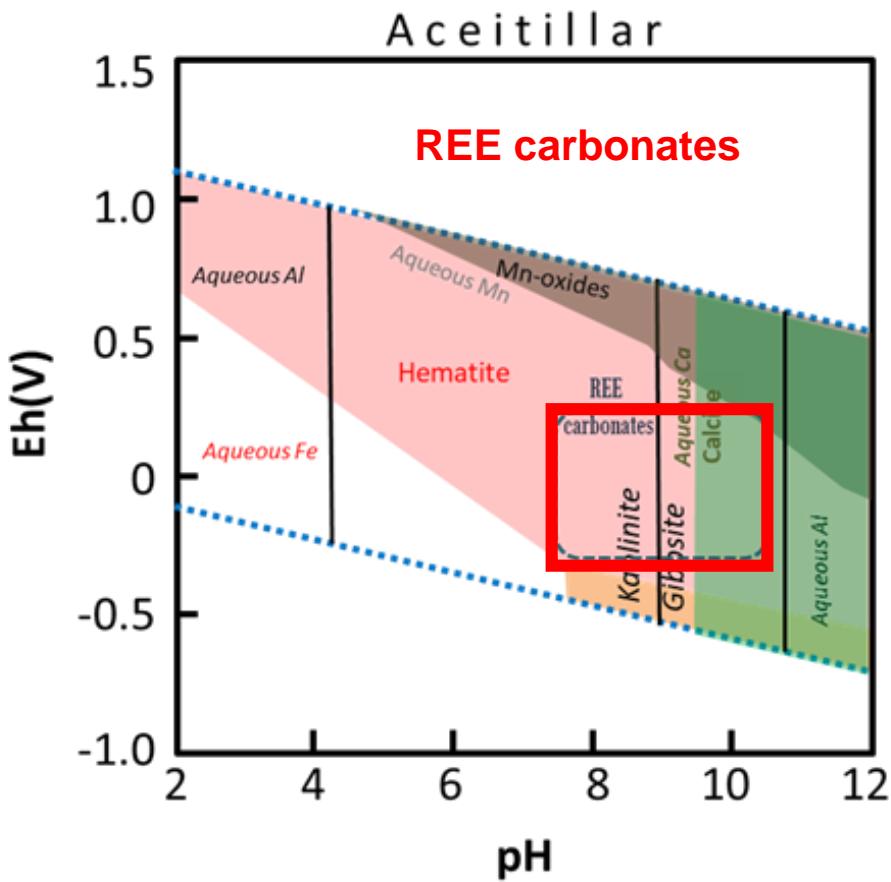




# Secondary REE mineral formation

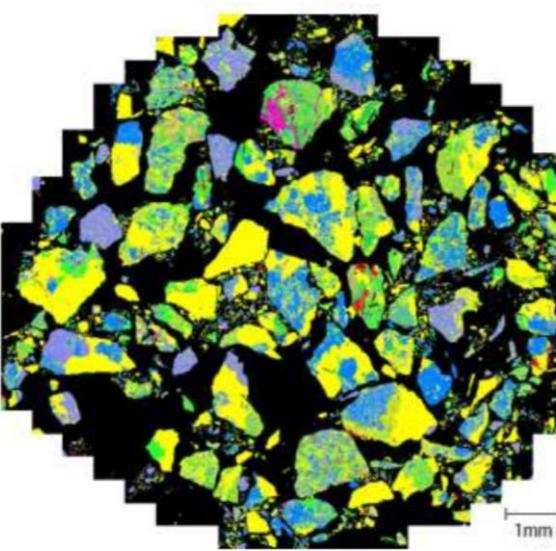
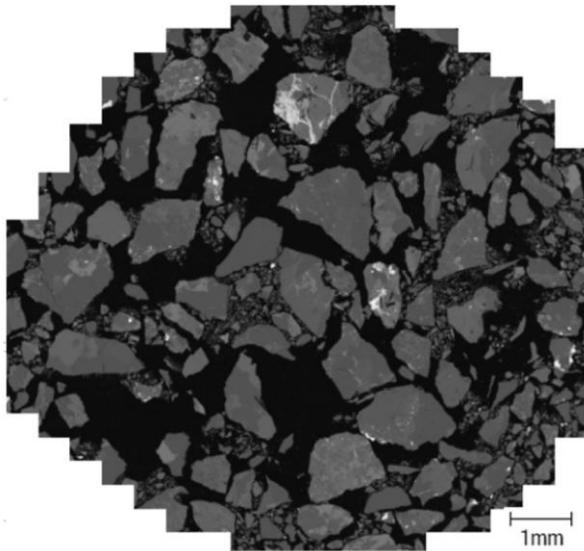
**REE minerals** form in a range from slightly acidic (REE phosphates) to alkaline conditions ( $6 < \text{pH} < 10.5$ ).

PhreePlot (Kinniburgh & Cooper, 2011)  
Phreeqc (Parkhurst & Appelo, 2013)

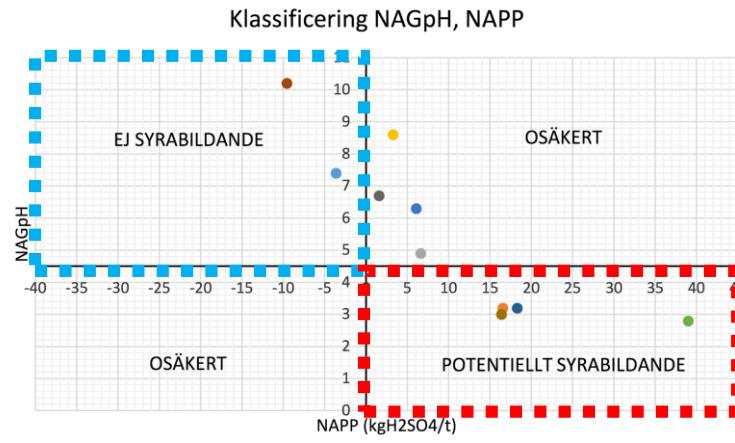




# Acid Mine Drainage Prediction using QanTmin



Mineral	Tillgängliga	Delvis låsta	Låsta
	%	%	%
<b>Sulfider</b>	<b>1,17</b>	<b>4,54</b>	<b>94,28</b>
Pyrit	0,30	1,56	98,14
Magnetkis	1,65	6,18	92,17
Kopparkis	0,00	0,00	100,00
Zinkblände	0,00	0,00	100,00
<b>Karbonat</b>	<b>1,95</b>	<b>7,41</b>	<b>90,64</b>
Kalcit	2,57	9,61	87,82
Ankerit	0,00	0,43	99,57





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**TACK SÅ MYCKET  
MANY THANKS FOR YOUR ATTENTION!**