

Field Emission Electron Microprobe Facility, Uppsala University, Sweden



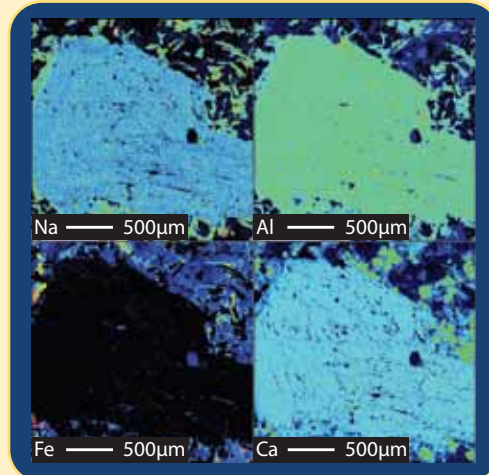
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Uppsala University has recently installed a new Field-Emission Electron Microprobe facility at Geocentrum (May 2011). This instrument will establish Scandinavian geosciences firmly in the world of nano-technology!

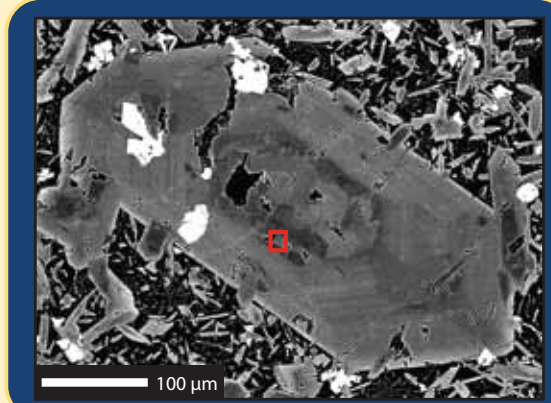


What is special about the FE-EMPA?

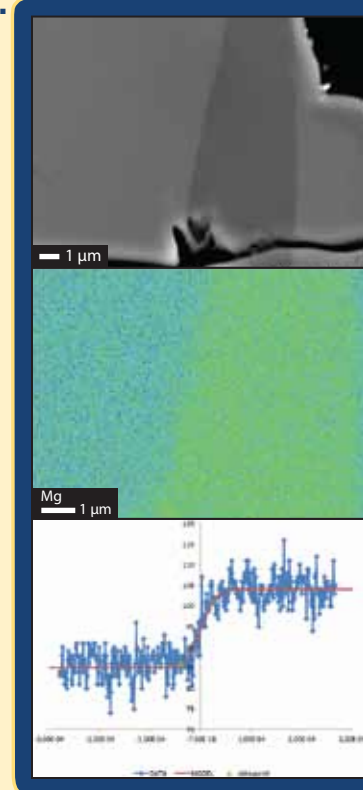
- All standard applications available e.g.
 - Energy-dispersive X-ray Spectroscopy (EDS).
 - Wave-length dispersive X-ray Spectroscopy (WDS).
- But, in addition:
 - Covers 90% of the periodic table.
 - Special crystal for ultra-light elements, e.g. Boron.
 - Imaging down to 3 nm.
 - Superb detection sensitivity of trace elements.
 - In-situ chemical dating of monazite.
 - High resolution diffusion profiles on a nano-scale.



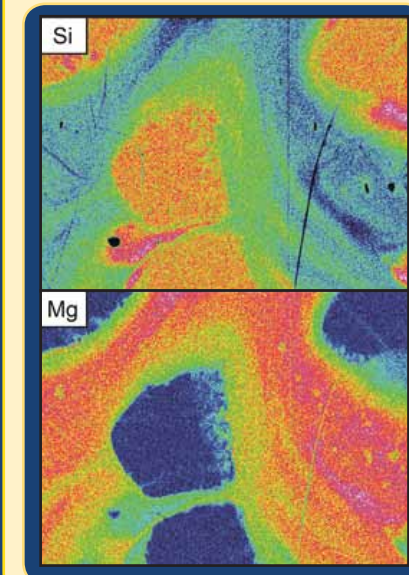
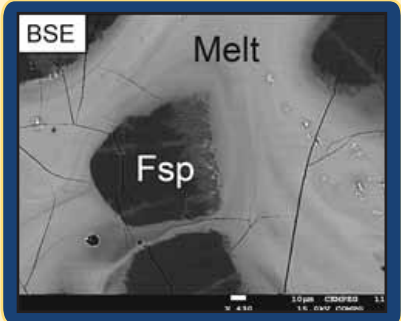
A. High resolution BSE imaging: one step further!



- Superior imaging resolution for working at high magnifications with enhanced detail.
- Increased numbers of step points allow for better model constraints on e.g. diffusion profiles.



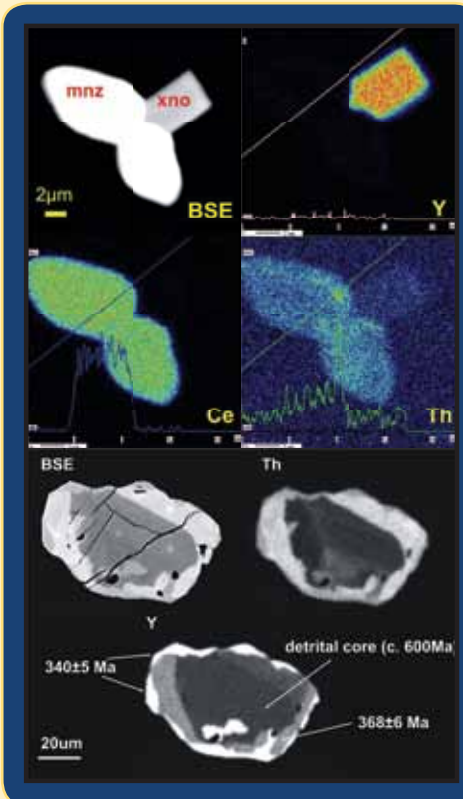
B. EDS Elemental Mapping: compositional information at the nanometer scale



- High resolution energy-dispersive X-ray Spectroscopy (EDS) elemental mapping.
- Analysis of e.g. partial melt reveals small scale chemical heterogeneities in Si and Mg.
- Combined with EMP traverses, chemical heterogeneities can be characterised at a high resolution, allowing for more accurate models.

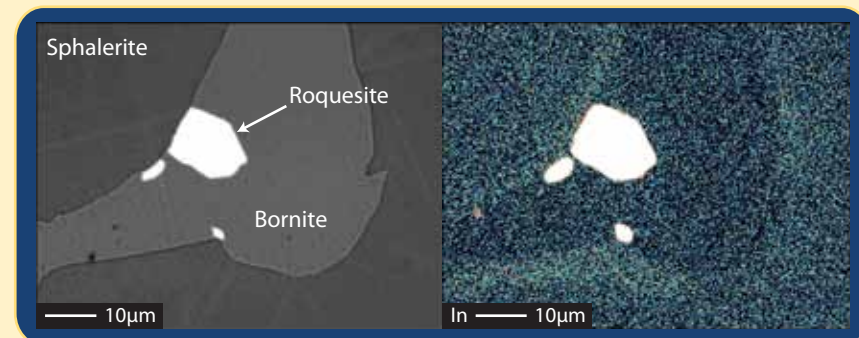
C. Monazite and xenotime

- Detection of chemical variation of trace elements on a sub-micron scale!
- Mapped crystals are down to 2-5 µm across. Th-enriched zone in monazite is only 200 nm in width. Note: xenotime includes Y, whereas monazite includes Th and Ce.
- Acquisition time: 10 minutes.
- Chemical dating is soon available for age determinations on monazite and xenotime.



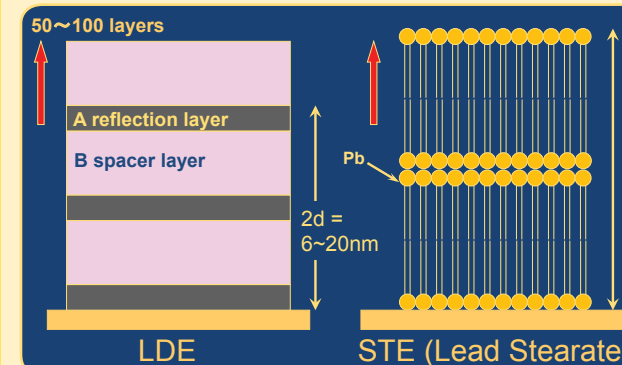
D. Rare Metal Minerals

- New technologies increasingly require rare metals.
- Roquesite: Copper Indium Sulphide (CuInS₂), recently found in a polymetallic mineralisation in Bergslagen, Sweden.



- Previously, ore with no remaining value was discarded.
- Mine dumps, old mines and areas of lower grade mineralisation may become the metal sources of the future.
- Next challenge: identification of how hi-tec metals are fixed using high resolution techniques to allow for optimal extraction methods to be designed.

Layered Dispersive Element (LDE)



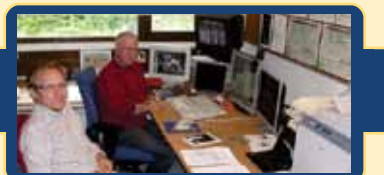
The new FE-SEM is equipped with a special crystal for analysis of ultra-light elements e.g. Boron.

E. Analysis of tourmaline, Rotliegend sandstone, Poland

- Width of biggest crystal imaged is ca. 1µm (0,001 mm).
- Electron beam focused to 10 nm (0,00001 mm, yellow spot).
- Result: 13,94 wt.% B₂O₃.



Access and Rates



Standard external rate:	5000 SEK/day
Standard industry rate:	8000 SEK/day
Internal and collaborative rate:	from 2500 SEK/day
	2500 SEK/day (standard applications)
	3500 SEK/day (non-standard applications)
Contact:	Jarek Majka (jaroslaw.majka@geo.uu.se) Abigail Barker (abigail.barker@geo.uu.se) Valentin Troll (valentin.troll@geo.uu.se)

Further details are available at:
<http://www.geo.uu.se/forskning/Berggrundsgeologi/mineralogi-petrologi/facilities/>

