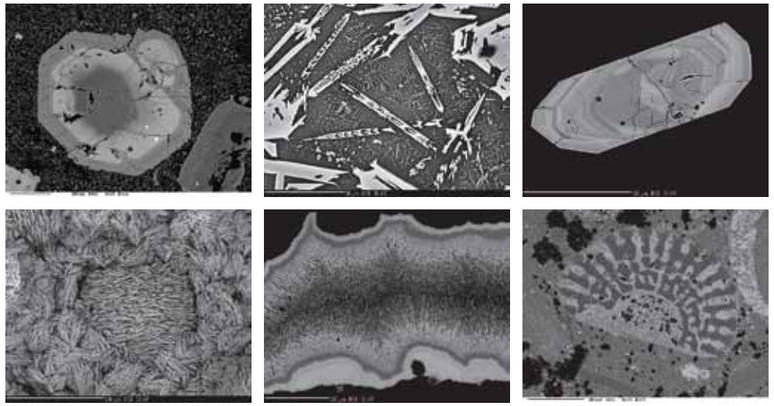
ELECTRON MICROPROBE LABORATORY

TECHNICAL SPECIFICATIONS

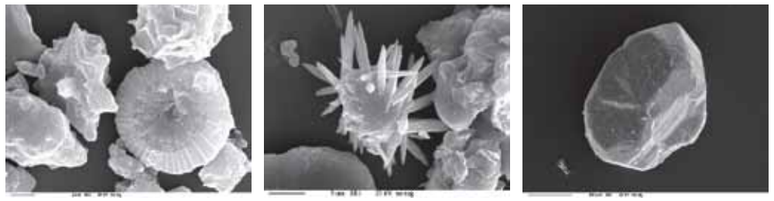
- Electron column with accelerating voltage up to 30 kV, with stable beam current and variable beam diameter
- Four wave-length spectrometers with large-area highly sensitive crystals
- Energy-dispersive analyzer EUMEX with WinEDS control unit
- 5-segment backscattered electron detector with high resolution (0,1 Z) working in modes Composition or Topography
- Secondary electron detector
- Cathodoluminescence detector (so called hot cathodolumi-nescence)
- Optical microscope with integrated CCD camera (optional zoom)
- Motorized sample holder with movement in three axes
- PeakSight control software (MS Windows compatible)
- Automation in the measurement of points, profiles and X-ray maps

IMAGE OUTPUTS

BEI backscattered electron images



SEI secondary electron images



CL cathodoluminescence images

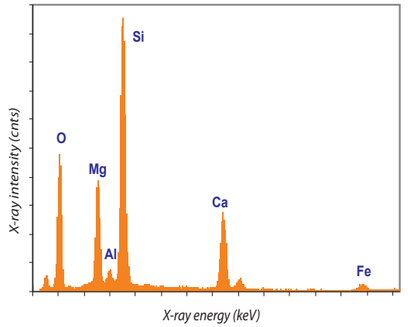
ANALYTICAL OUTPUTS

Quantitative chemical analyses

	Weight%	Norm Weight%	Atomic%	StdDev wt%	Det.Lim ppm
Si	1,0696	1,0678	1,5399	0,0325	202
P	11,6719	11,6524	15,2376	0,351	334
Pb	0,2198	0,2194	0,0429	0,0246	259
Th	7,4012	7,3889	1,2898	0,1351	425
U	0,4288	0,4281	0,0729	0,0414	436
Y	1,2439	1,2418	0,5658	0,0738	410
S	0,0124	0,0121	0,0152	0,0207	241
Ca	0,1000	0,0977	0,0986	0,0197	213
Fe	0	0	0	0,047	655
Al	0	0	0	0,017	207
As	0,1022	0,102	0,0552	0,0554	635
Sr	0	0	0	0,0678	825
La	0	5,7697	1,6824	0,3219	1668
Ce	19,7715	19,7385	5,7057	0,5531	1566
Pr	3,2734	3,2679	0,9393	0,3065	2377
Nd	13,1735	13,1516	3,6931	0,4223	1199
Sm	4,1265	4,1196	1,1094	0,2555	1879
Eu	0,0350	0,0349	0,0093	0,1687	2018
Gd	3,8786	3,8721	0,9974	0,1722	1019
Tb	0,2426	0,2422	0,0617	0,0981	1104
Dy	0,4518	0,4511	0,1124	0,1565	1779
Ho	0,1712	0,1709	0,042	0,148	1742
Er	0,2883	0,2878	0,0697	0,1558	1810
Tm	0,5251	0,5243	0,1257	0,0625	660
Yb	0,0838	0,0836	0,0196	0,0586	691
Lu	0,0185	0,0185	0,0043	0,1428	1715
O	26,4032	26,3592	66,7278		
Total	100,48633	100,3189	100,2368		

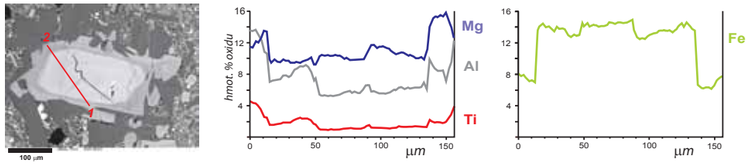
Monazite analysis

Element identification (EDS)



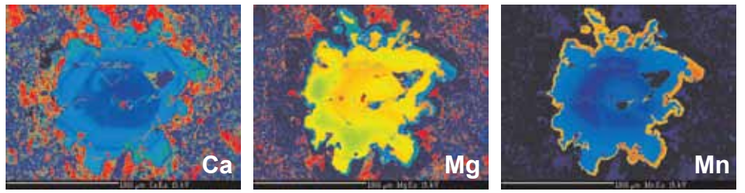
EDS spectrum of clinopyroxene

Line profiles



The profile across clinopyroxene

X-ray mapping



ANALYTICAL FEATURES

Quantitative wave-length dispersive (WD) chemical analyses
highly accurate chemical analyses of elements from boron to uranium
(routine precision 0.01 wt. %)

Qualitative energy-dispersive (ED) chemical analyses
enable fast element indentification in the investigated material

Line profiles
provide information about the variation of the element concentration along the profile

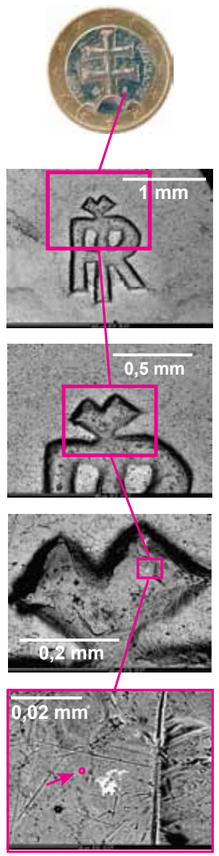
X-ray mapping
provide information about the areal distribution of selected elements

SEI (secondary electron images)
provide information about the sample surface (shape, size and morphology of particles and paleontological objects), about porosity and crystal orientation

BEI (backscattered electron images)
provide information about the material contrast reflecting variability of average atomic weight of investigated material. Brighter areas correspond to elements with higher average atomic weight as have darker ones

CL (cathodoluminescence images)
provide information about the growth zonality of crystals, about the internal structure of materials independently of their chemical composition. Only some materials show cathodoluminescence (quartz, zircon etc.)

3 micrometers are sufficient for the analysis



detail of 1 euro coin magnified to size of the area sufficient for the analysis (circle)

APPLICATIONS

Geology, mineralogy and petrology
- chemical analyses of elements in mineral phases from boron to uranium with accuracy up to 0.01 wt. %
- chemical analyses of the mineral groups: silicates, carbonates, oxides, REE-Y minerals, Nb-Ta-W minerals, sulphides, sulphosalts, Au-Ag minerals , Se-Te minerals, sulphates, phosphates
- geochonology: rock age estimation based on highly accurate analyses of U, Th and Pb in minerals (monazite, thorianite, xenotime and uraninite)
- images of organic fossils (nannoplankton)

Environmental hazards
- environmental pollution: composition of dust, industrial ash and materials from the mine dumps and setting pits

Building industry
- composition and structure of building stones, decoration stones, building ceramics and cement mixtures, investigation of concrete exposed to interactions with aggresive environment and evaluation of the stage of its break-down; weathering of the memorials, stones and concrete constructions

Restoration
- composition of paintings and sculptures

Archaeology
- composition of the paleolithic stone tools in order to determine the source area of their material, composition of the fragments of Roman armour and coins, composition of historical glasses, ceramics and metallic artefacts; teeth and bones composition, etc.

Electrical engineering
- monitoring of impurities in semiconductor components and composition of optical mineral wires

Metallurgy
- composition of steel and other metallurgical products, distribution of elements in these materials

Health care
- composition of kidney stones, gallstones (growth zones) and dental technics

State Geological Institute of Dionýz Štúr

Dept. of special laboratories
laboratory of electron microanalysis

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Personal staff comprises skilled persons with long lasting practice in the field of electron microanalysis, microscopy and geology. The laboratory services are used by customers from Slovakia (geologists from ŠGÚDŠ, GÚ SAV a PriF UK as well as colleagues from other organisations) and from the foreign countries (Poland, Czech republic, Slovenia, Croatia, Hungary, Norway, Ukraine, Greece, Turkey, United States and Canada).

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State Geological Institute of Dionýz Štúr

Bratislava

CAMECA SX 100

electron probe microanalyzer