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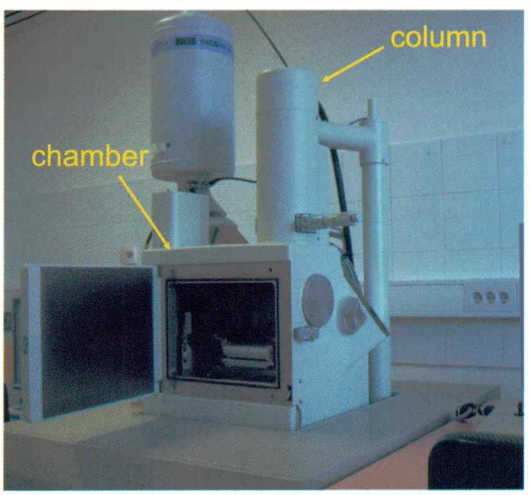
SCANNING ELECTRON MICROSCOPE WITH ENERGY DISPERSIVE X-RAY SPECTROMETER (SEM/EDS) AT THE GEOLOGICAL SURVEY OF SLOVENIA

At the beginning of 2008, the Geological Survey of Slovenia obtained a new analytical instrument for morphological surface analysis and qualitative to semi-quantitative chemical microanalysis of materials. This instrument is a scanning electron microscope (SEM) coupled with energy dispersive spectrometer (EDS).

Basic SEM/EDS components and principles of operation:



The major parts of a SEM/EDS are: vacuum specimen chamber, electron column with electron source, electromagnetic lenses, scanning coils and signal detectors (SE, BSE, EDS).

A number of signals, such as **secondary electrons** (SE), **backscattered electrons** (BSE) and **X-rays**, result from interactions of a focused scanning electron beam with the atoms of a specimen, thus providing different information about the sample.

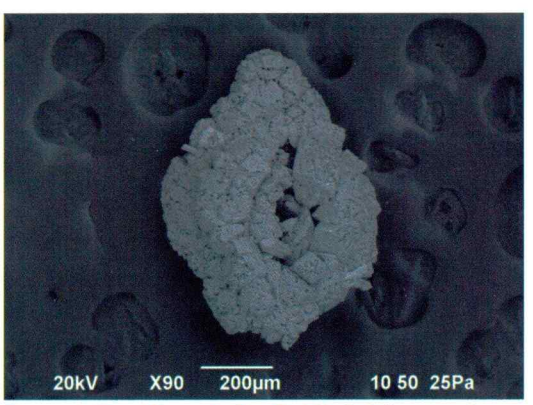
- **SE** provide topographical image of sample surface.
- **BSE** depend on atomic number and provide relative compositional image of the sample.
- **X-rays** provide information about elemental composition of the sample.

SEM/EDS applications:

SEM/EDS at the Geological Survey of Slovenia is applied to different fields of geology.

Palaeontological studies:

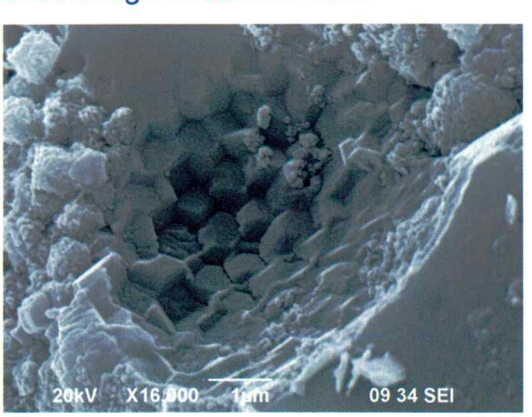
Low-vacuum mode enables a non-destructive analysis of valuable samples without prior preparation.



Recrystallised foraminifer *Ophthalmidium* sp. from the Bača dolomite

Sedimentary petrological studies:

High resolution and magnification can be achieved in high-vacuum mode.



An imprint of framboidal pyrite in a quartz grain from oligocene marine clay

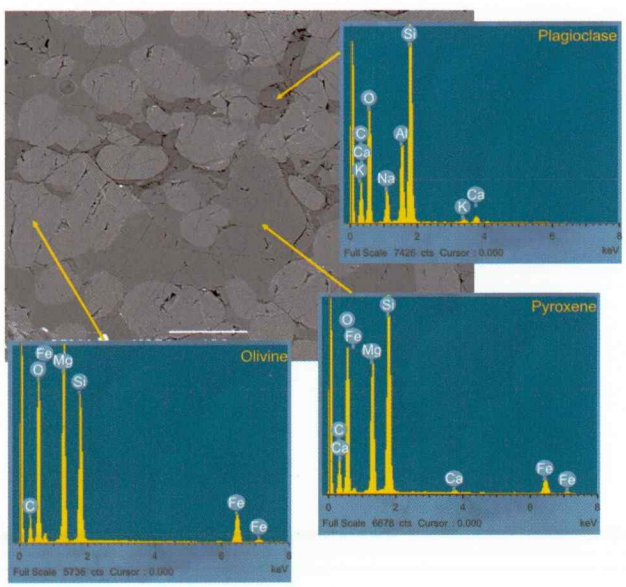
Coal studies:

Samples containing gases and liquids can be observed in low vacuum. High magnification image of homogeneous coal reveals flaky structure, which is important for understanding of coal porosity.

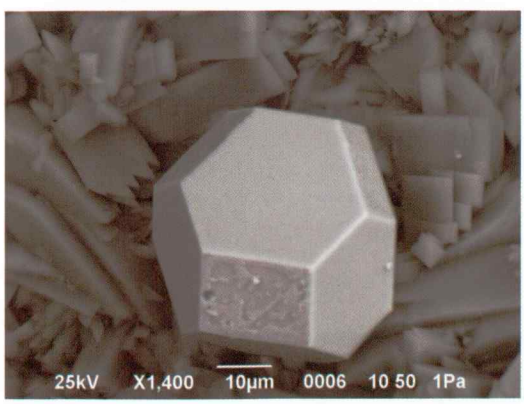
Flaky structure in homogeneous finedetritic lignite

Mineralogical studies of materials:

Mineral composition of materials can be accurately determined by semi-quantitative elemental EDS analysis of polished sections.



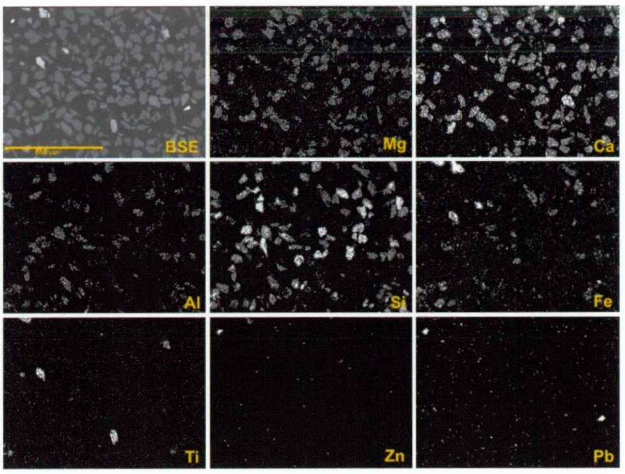
Olivine, rhombic pyroxene and plagioclase matrix with EDS spectra in chondrite meteorite



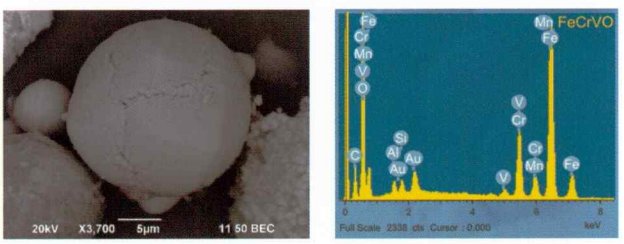
Truncated octahedral pyrite crystal associated with zeolite crystals in tuff

Geochemical studies of environmental media:

SEM/EDS supplements geochemical analyses with data on morphology, mineralogy and sources of heavy metal-bearing phases in environmental media

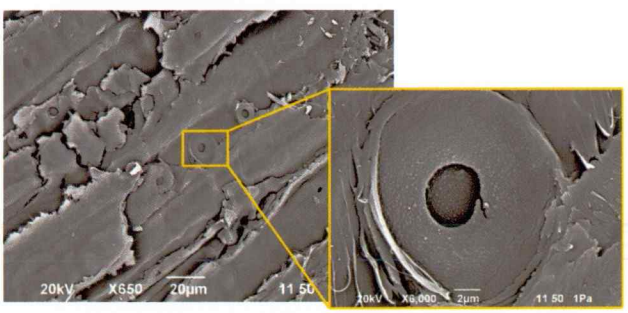


BSE image and EDS mapping of elements in river sediment

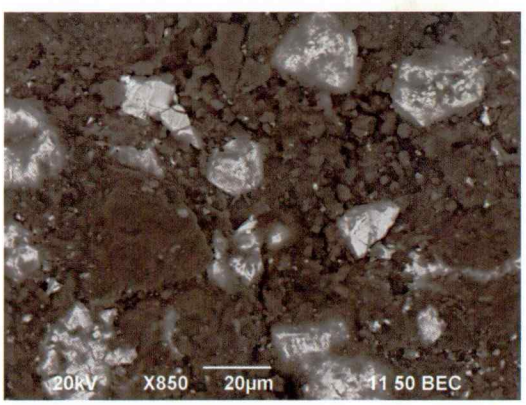


Solid spherical particle of (Cr, V, Fe)-oxide from urban snow deposit, resulting from iron and steel melting processes

Other applications:



Wood structure in xylite with detail of bordered pit



HgS on inner wall of ancient earthen vessel used for roasting of cinnabar ore

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