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.

Sedimentary petrological studies:
High resolution and magnification can be achieved in high-vacuum mode.

Recrystallised foraminifer Ophthalmidium sp. from the Bača dolomite

An imprint of frambooidal 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.

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

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.

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