Laboratory of Scanning Electron Microscopy and Microanalysis

Department of Chemistry, Life Sciences and Environmental Sustainability

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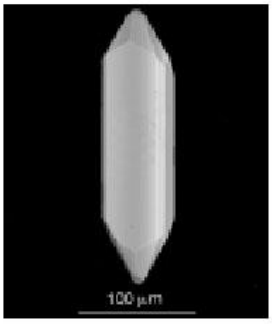
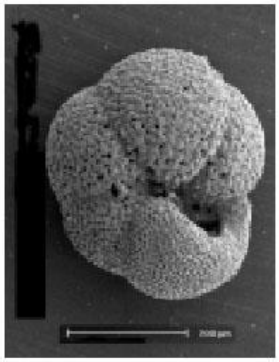


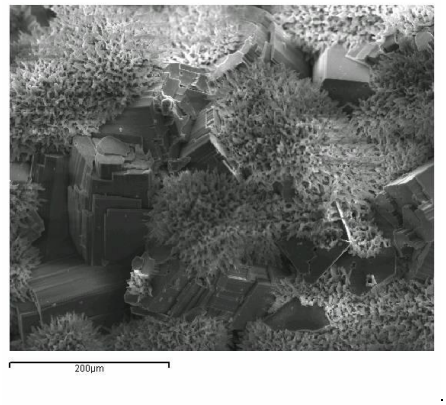


INSTRUMENTS

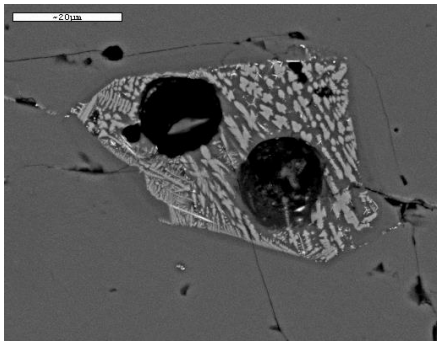
- **Scanning Electron Microscope JEOL 6400, operating under high vacuum conditions (10^{-4} Pa) and up to 300.000 magnifications**
- **Energy Dispersive X-Ray Microanalysis System (EDS) Oxford-INCA, with Si(Li) window-less detector and a friendly software**
- **A vacuum evaporator JEOL JEE-4X for specimen preparation**

POSSIBLE ANALYSES

- Secondary electron images; the acquisition of secondary electron signal allows to obtain morphological information on the sample. The signal of secondary electron is collected by a scintillation detector



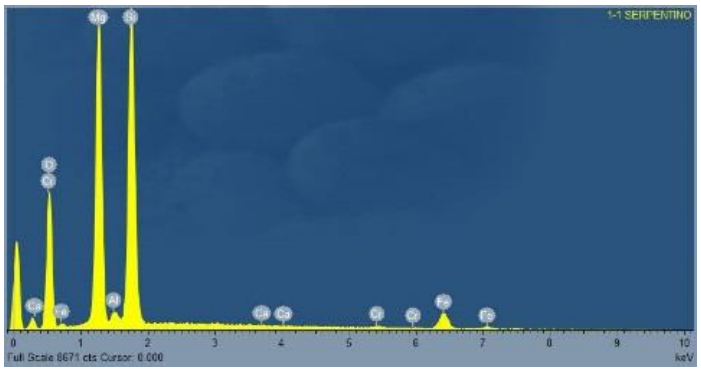
- Backscattered electron images; the signal of backscattered electron is collected by a pair semiconductor detector to obtain topographic and compositional information. The compositional image shows the atomic number contrast of the specimen (as shown in the picture below).



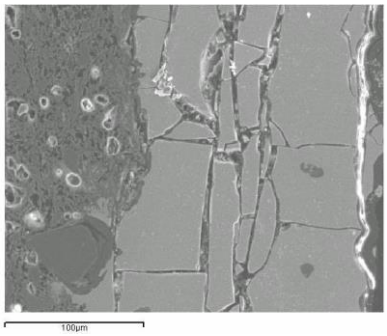
- X-Ray detection by Si(Li) window-less detector. It is possible to have the following informations:

  - Qualitative analyses on different types of samples
  - Standardless semi-quantitative anlyses
  - Quantitative analyses after acquisition of international standard samples, consisting of pure elements, simple oxides or simple silicate compositions
  - X-Ray maps to investigate element distribution on the investigated sample surface
  - Analyses of element distribution along a line profile (linescan)

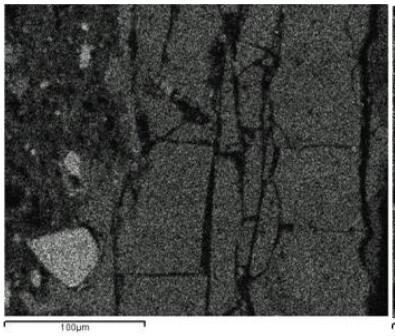
The software allows you to perform chemical analysis on the scanned image or on an image scanned by the microscope, and take pictures in various formats.



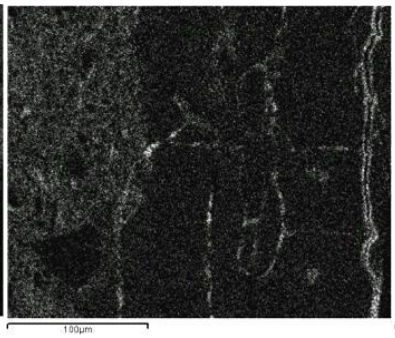
X-Ray spectrum on serpentine



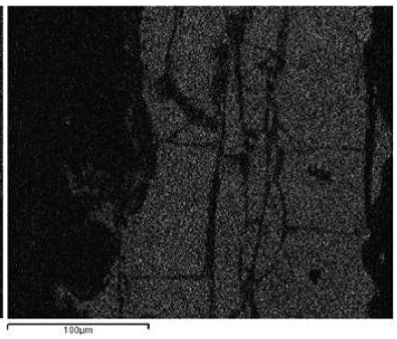
secondary image and X-Ray maps of glass coating of pottery shard



Si



Al

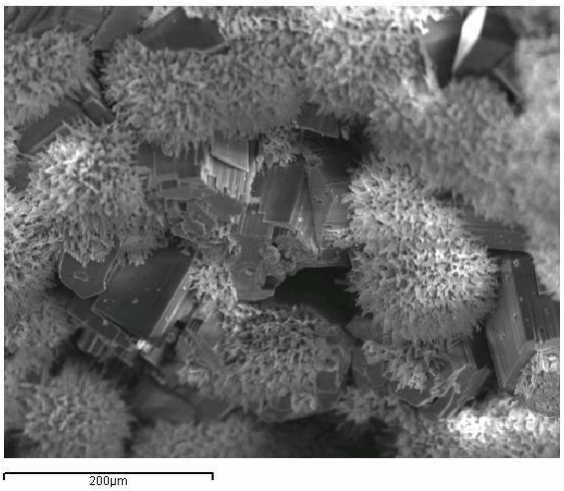


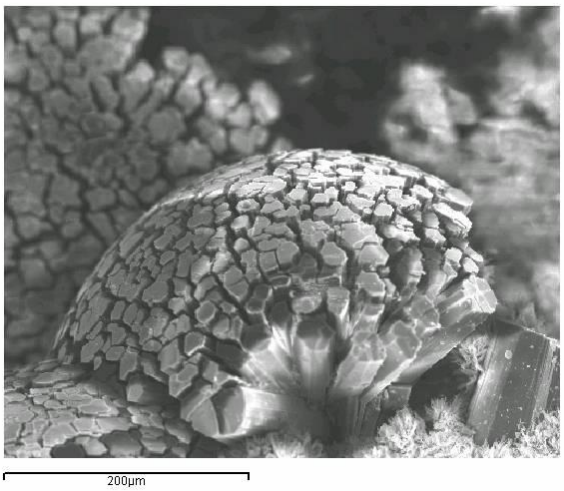
Pb

FIELDS OF INTEREST

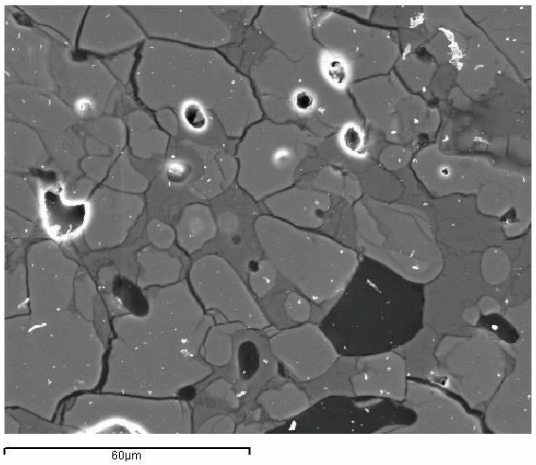
MINERALOGY, PETROGRAPHY

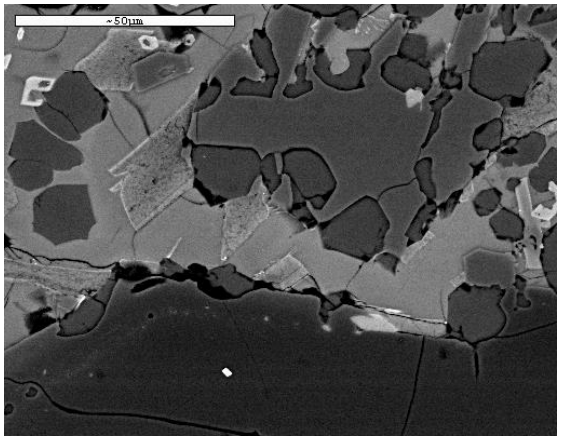
- Identification of minerals



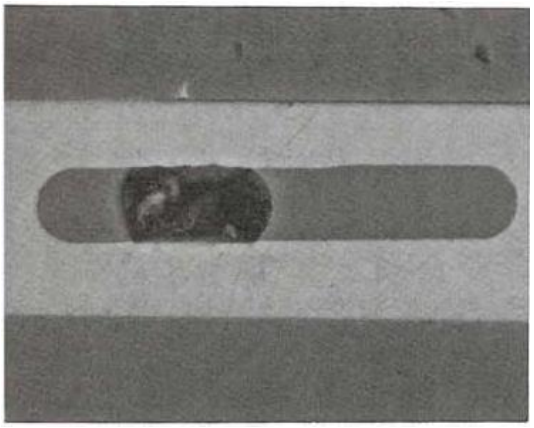


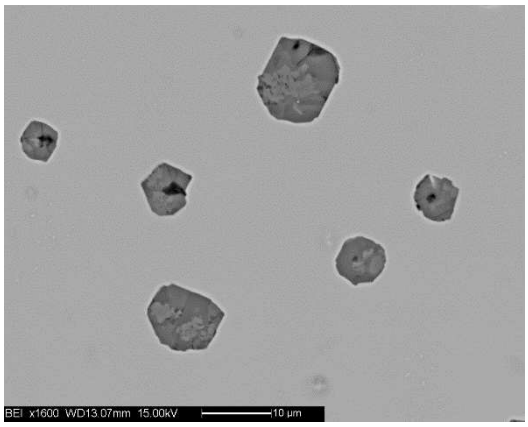
- Identification and chemical composition of rock-forming minerals after preparation of rock polished sections with thickness of about 60 µm



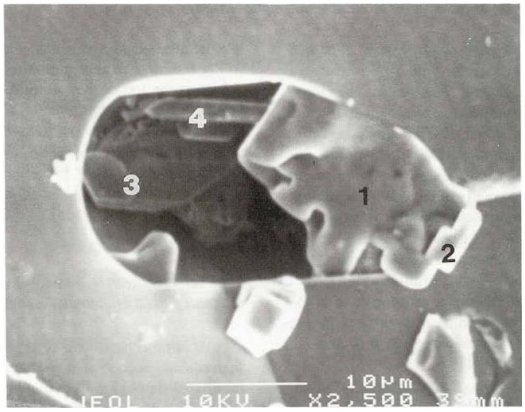


- Chemical analyses of the glass portion of silicate melt inclusions and of the mineral phases included in the melt inclusions





- Chemical analyses of salt in fluid inclusions after opening of the inclusions (in the picture below the numbers indicate: 1 halite, 2 sylvite, 3 K-Ca-sulphate, 4 phosphate)

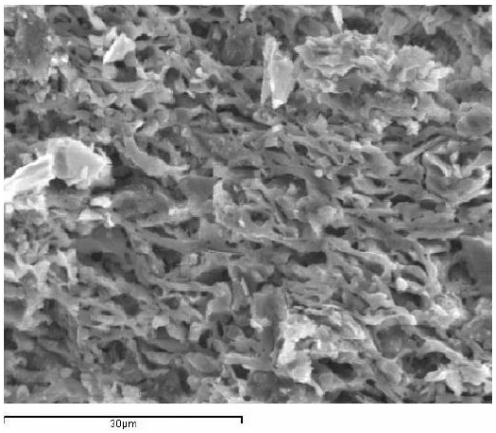


GEOLOGY, PALEONTOLOGY, MICROPALEONTOLOGY

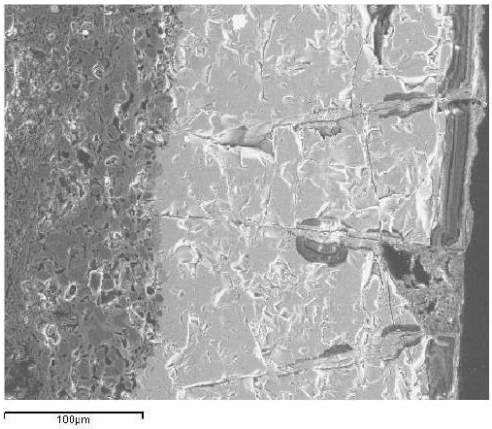
- Identification of microfossils
- Morphological features of scales, teeth, otoliths of sharks
- Identification and features of pollen

CULTURAL HERITAGE

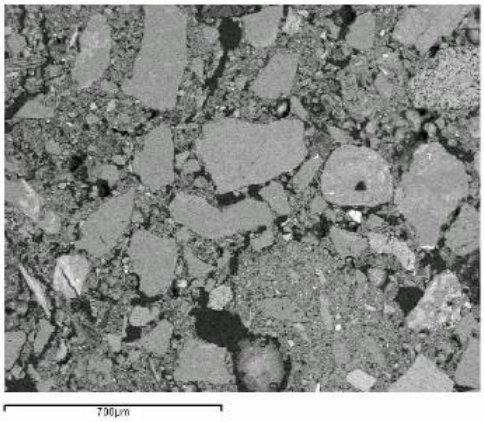
- Features and chemical analyses of stone materials and pottery sherds
- Features and chemical analyses of plasters and mortars
- Chemical analyses of pigments in paintings that allow us to give a date of the work and the various interventions over time



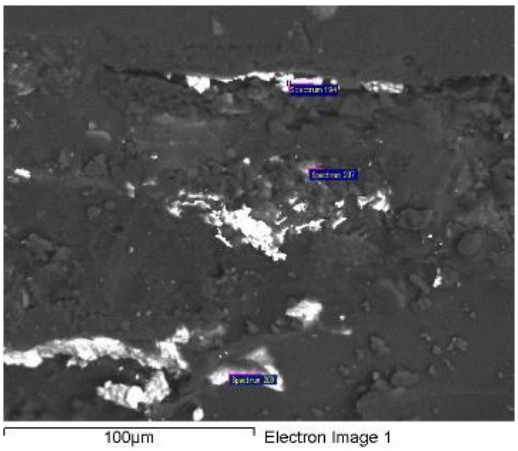
Glass morphology in a pottery sherd



Coating of a ceramic vessel



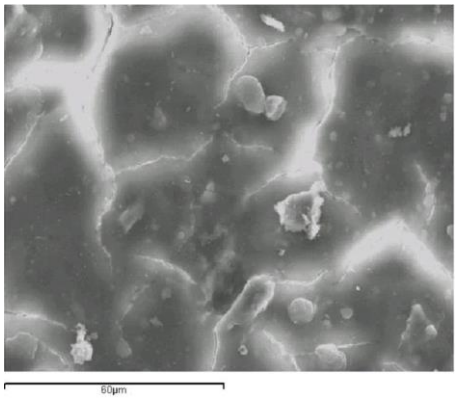
Section of plaster



Pigments of a painting

APPLIED PETROGRAPHY, ENGINEERING

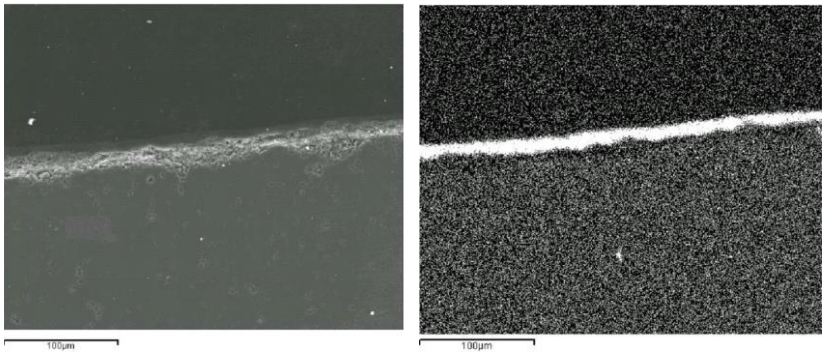
- Surface analyses of stone materials
- Analysis of mortars to characterize the type of mortar used in various variety of building works



Surface of a stone treated with gel

CHEMISTRY

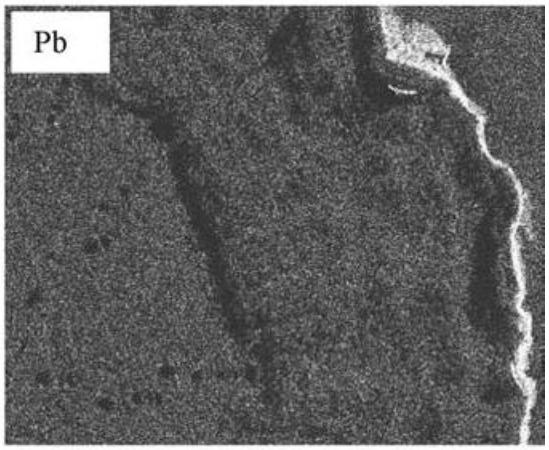
- Analyses of various type of materials: glasses, protective films of stone materials, protective films of plastic materials, prepared for dental compounds, diamond blades, paint additives



Surface of the stone treated with gel to verify the degree of penetration of the protective

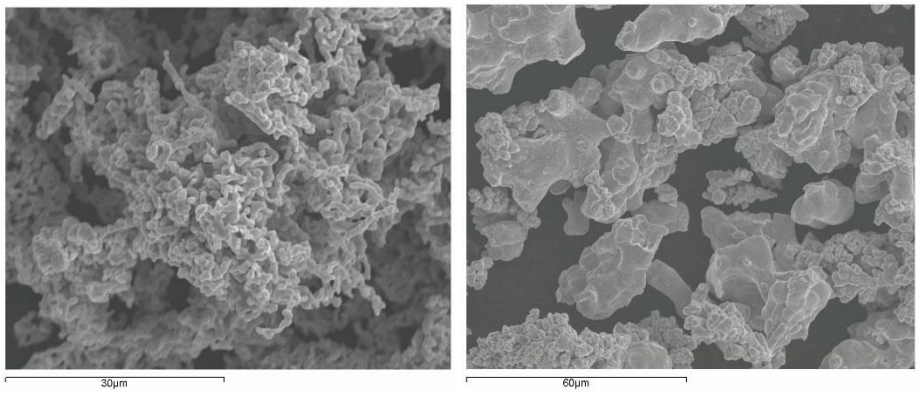
BIOLOGY

- Surface and X-Ray maps of leaves and trunk sections to study the absorption of pollutants by plants



ENGINEERING

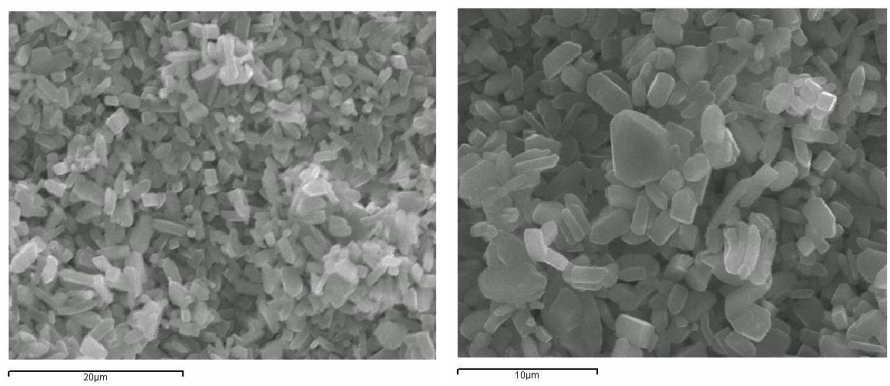
- Study of abnormalities in steel processes or metal treatments



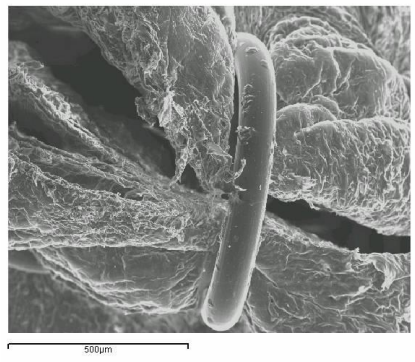
Powdered metals ready to be die-cast

PHARMACY

- Photographs of active ingredients and excipients
- Characterization of generic medications
- Study of bacterial colonies, venous catheters, nails and bones joints



Drugs



Prototypes of equipment on organic tissues

GENERAL INFORMATIONS

Customized courses are provided to the structured staff to make users independent. The technical manager is always available for advice and to resolve operational anomalies of various types.

RELATIONS WITH THE OUTSIDE

Several companies operating in different sectors (food, pharmaceutical, chemical) can access the instrumentation for quality control, for the development of new products or new production lines. We can provide analysis for single or continuous periods, always assisted by the presence of one of our technician, using a specific price list.