Field Emission Scanning Electron Microscopy and Energy Dispersive X-ray Spectroscopy (FE-SEM/EDS)

Data sheet

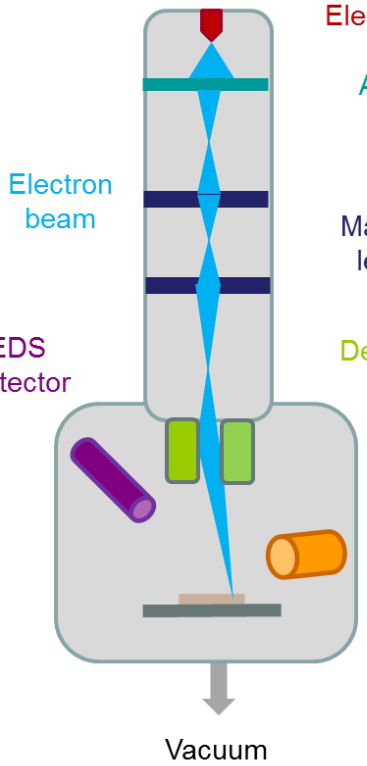
Type of samples: Organic or inorganic powder, film, cream, tissue…
Tension: 0.02 to 30 kV
Magnification: 12 - 1,000,000 X
Resolution: 0.8 nm at 15 kV
2.0 nm at 0.1 kV
Typical sample size: few nm to a few mm
EDS detection limit: 0.5-2 weight % for most elements
Typical acquisition time:
a few seconds for FE-SEM
a few minutes for EDS
Available sample environment: variable pressure from 2 to 133 Pa

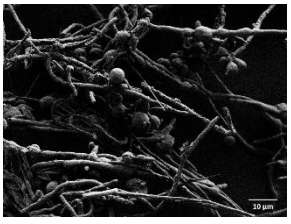
Why FE-SEM/EDS ?

Field Emission Scanning Electron Microscopy produces images of the surface of samples using a low energy electron beam thanks to a Field Emission Gun. This instrument allows to observe fragile and low melting temperature samples like creams, which is not possible by standard Scanning Electron Microscopy.

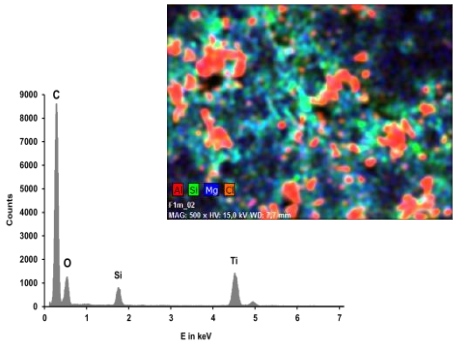
Principle

The primary electron beam interacts with the atoms at the surface (down to 1 µm depth) of the sample generating low energy secondary electrons, the energy of which is governed by the surface topography. By scanning the sample and collecting the secondary electrons, an image of the topography of the surface is constructed.





In addition to secondary electrons imaging, Energy Dispersive X-ray Spectroscopy (EDS or EDX) analysis is used for chemical analysis.
The EDS system detects the X-photons emitted by the sample after excitation by the electron beam. The energies of the emitted X-photons are characteristic of each chemical element.



X-ray spectra give quantitative information about the elemental composition of the sample surface. 1D scans and 2D maps can be generated.

Comparison with similar techniques

- Better resolution than optical microscopy and standard SEM,
- Less sample degradation than standard SEM,
- No sample coating required like for SEM,
- Less expensive and faster than X-ray micro-fluorescence, but less sensitive.

Applications

- Imaging of gels deposited on a support,
- Imaging of particles or nanoparticules in gels or deposited on substrates,
- Identification and localization of ingredients in pharmaceutical powders and tablets or cosmetics,
- Imaging of biological tissue, biofilm, microorganism, …
- Imaging of textured surfaces,….