2009 spring

Microstructural Characterization of Materials

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Type of analysis

- 영상분석: 미세조직 분석
  - **SEM, TEM, STEM**

(surface morphology)

- 전자회절분석: 결정구조분석
  - **CBSD, CBED, SAED, Kikuchi pattern**

(crystllograhic structrue)

- 화학분석: 화학성분분석
  - **EDS, EELS, AES**
    - **(Element, composition)**

Type of analysis

Primary e⁻ (with high energy)

Backscattered e⁻
SEM

X-ray (Characteristic, flourescent)
EDS, WDS, XRF

Cathodoluminescence

Secondary e⁻
SEM

Auger e⁻
AES, SAM

Diffracted e⁻
- elastic ; **SAD, microD, CBED**
- inelastic ; **Kikuchi, EELS**

Transmitted e⁻
TEM, STEM

Type of analysis

Chemical element

X-Ray

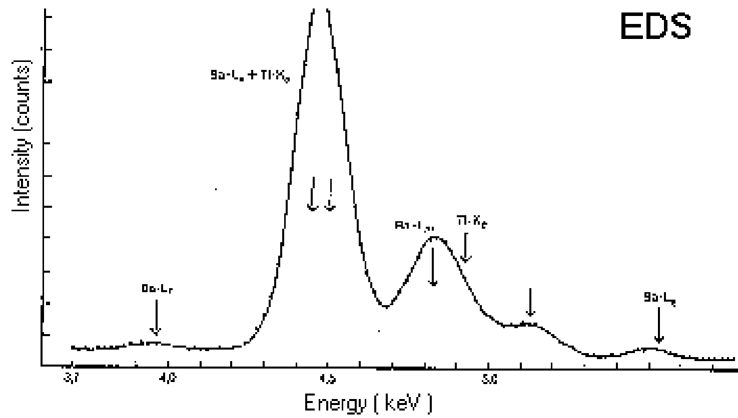
- **EDS :** Energy Dispersion Spectroscopy
- **WDS:** Wavelength Dispersive Spectroscopy
- **XRF:** X-Ray Fluorescence

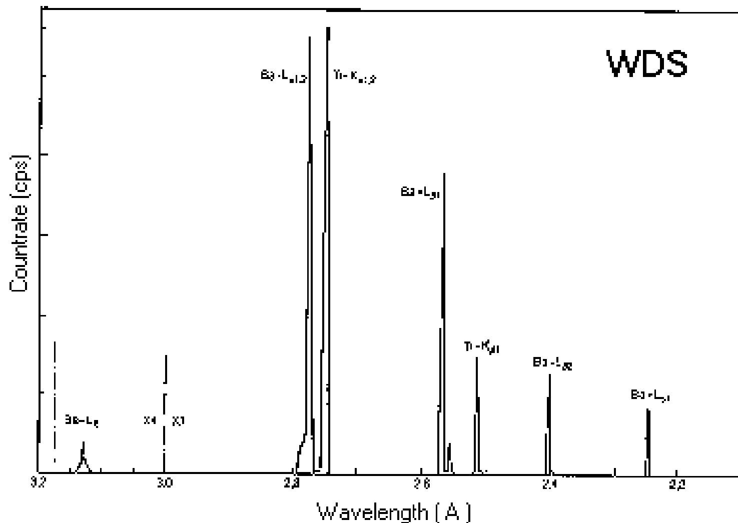
Electron

- **EELS:** Electron Energy Loss Spectroscopy

Type of analysis EDS

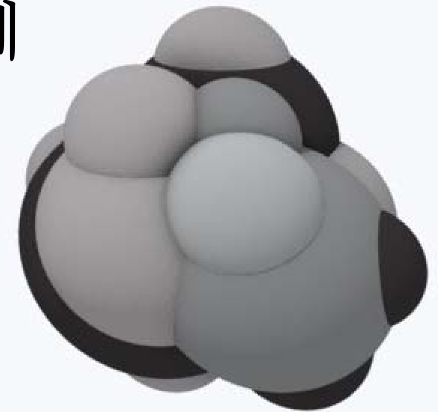
Chemical element





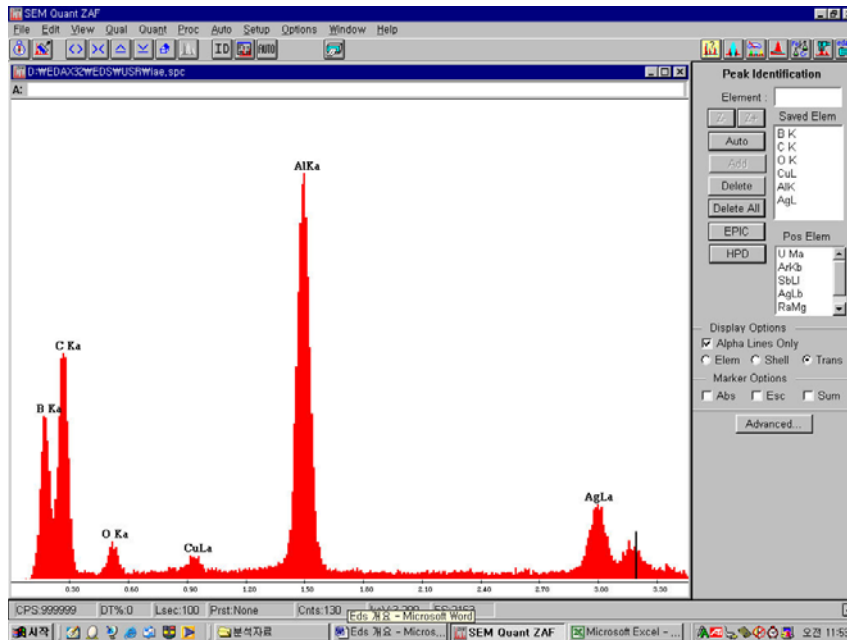
- 특성 X-선은 원자의 종류 및 전자 궤도에 따라 다르므로 이를 이용하여 시편의 화학적 성분을 정성 혹은 정량분석을 할 수 있다.

- EDS 는 정성분석에, WDS 는 정량분석에 이용한다.



Type of analysis EDS

Chemical element



X-Ray Spectrum 분석

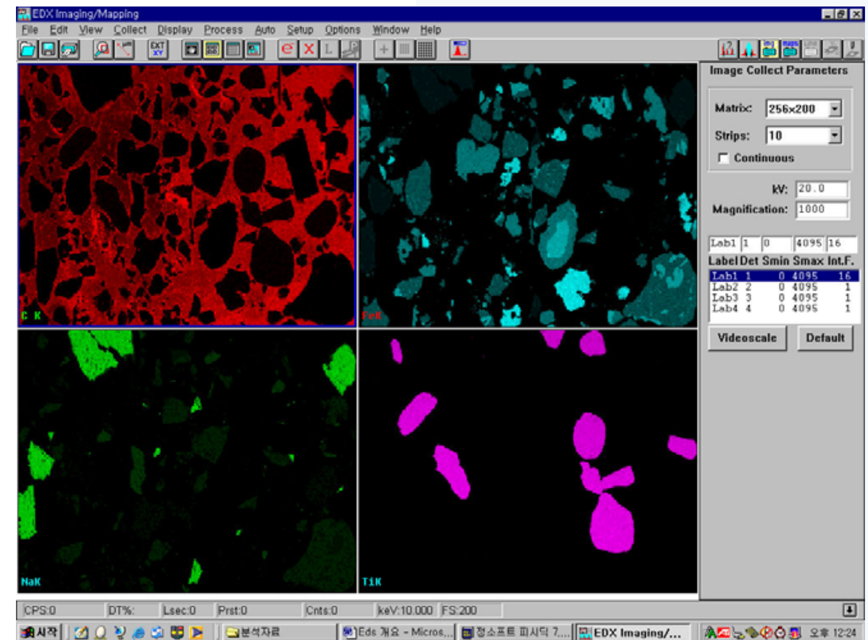
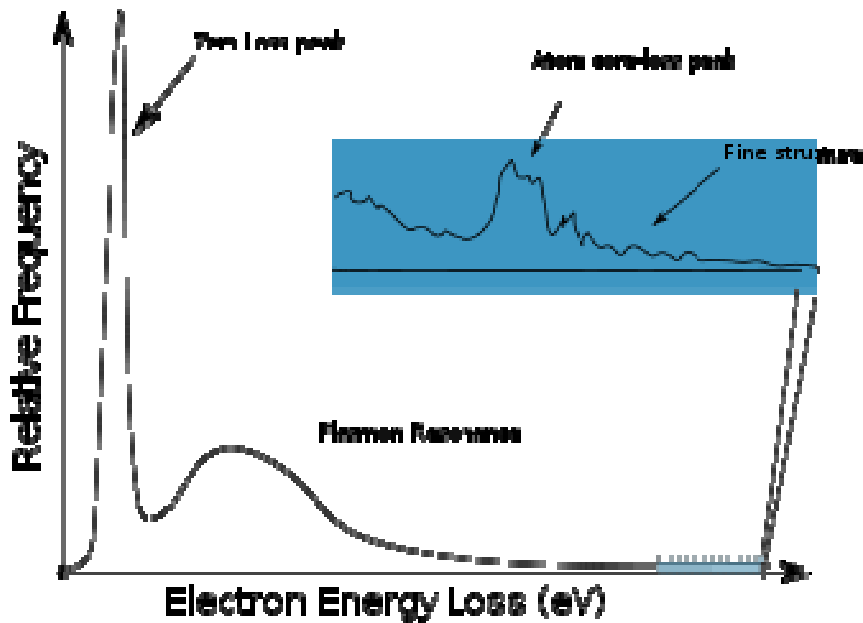
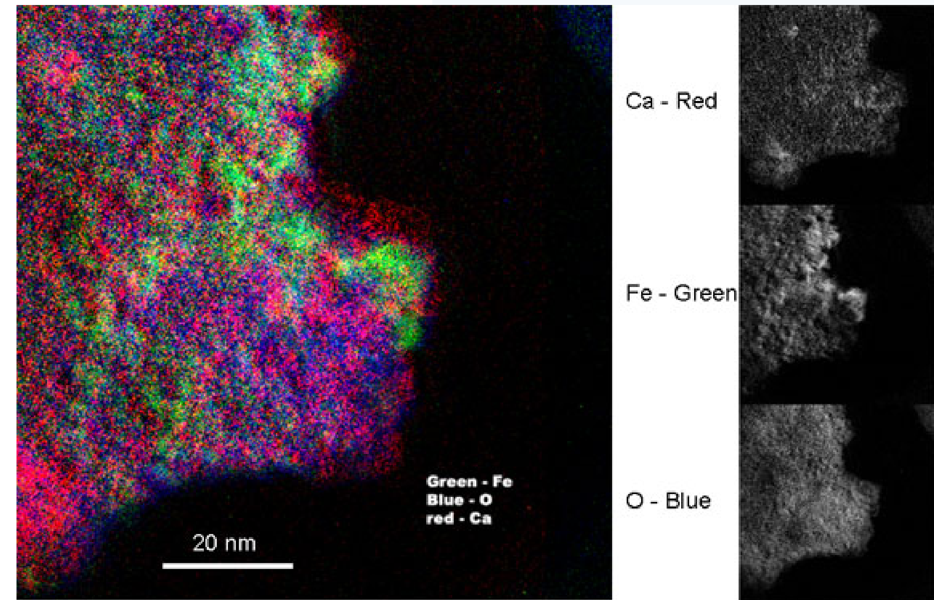


Image Mapping

Type of analysis EELS

Chemical element



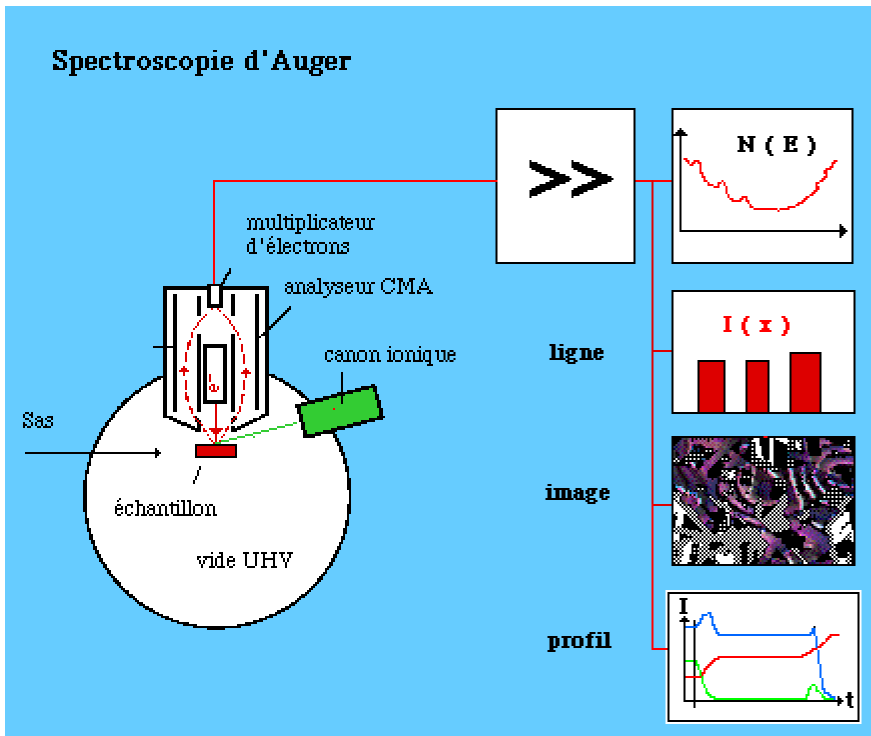


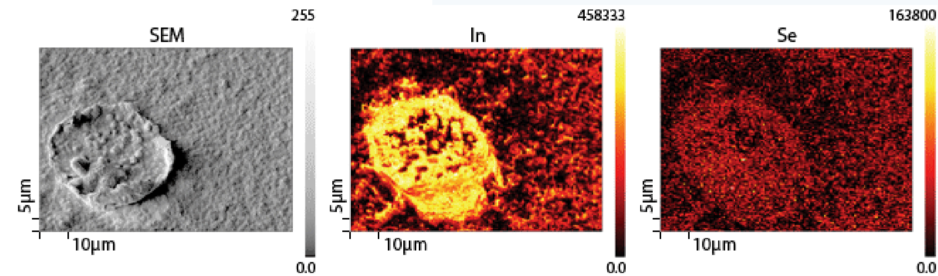
atomic composition, chemical bonding, valence and conduction band electronic properties, surface properties, and element-specific pair distance distribution functions

Type of analysis

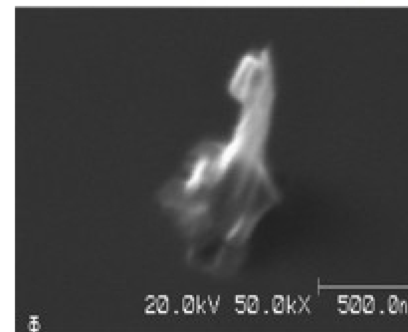
Chemical element: surface-specific analytical technique

- **AES :** Auger Electron Spectroscopy
- **SAM:** Scanning Auger Microscopy

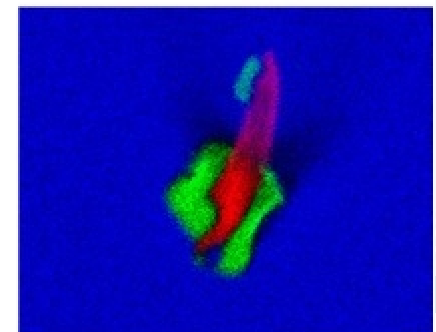




Secondary Electron Image



Color Composite Auger Maps



Red - Ti Green - Cu Blue - Si

Type of analysis

Crystallographic structure

- **CBED:** Convergent Beam Electron Diffraction
- **SAD:** Selected Area electron Diffraction