3D Laser Scanning Microscope – Keyence VK-X200

The laser microscope is a device for imaging and measurement that enables sample observation using a large depth of focus and 3D measurement simultaneously. It couples a laser with an optical microscope to create high-resolution images with nanometer Z-axis measurement data.
Scanning Electron Microscope – Zeiss ULTRA Plus FESEM

- Imaging of material samples
- Elemental and crystal structural microanalysis
- Field emission gun (FEG)
- Acceleration voltage: 0.02–30 kV
- Resolution: 1.0 nm/15 kV, 1.7 nm/1 kV, 4.0 nm/0.1 kV
- Detectors: two SE, two BSE, one STEM
- EDS detector and EBSD camera (Oxford Instruments)
- Elemental analysis from carbon to uranium
Imaging of material samples
Elemental and crystal structural microanalysis
Field emission gun (FEG)
Acceleration voltage: 0.1–30 kV
Resolution: 1.3 nm/20 kV, 1.5 nm/15 kV, 2.8 nm/1 kV
Detectors: two SE, one BSE
EDS detector and EBSD camera (EDAX)
Elemental analysis from carbon to uranium

Scanning Electron Microscope – Zeiss Sigma FESEM
Scanning Electron Microscope – JEOL JSM-7900F FESEM

• High-end scanning electron microscope for imaging, elemental analysis and crystal structural characterization
• Field emission gun (FEG)
• Acceleration voltage: 0.01–30 kV
• Beam deceleration function
• Resolution: 0.6 nm/15 kV, 0.7 nm/1 kV, 1.0 nm/0.5 kV
• Detectors: two SE, two BSE
• EDS detector and EBSD camera (Oxford Instruments)
• Transmission Kikuchi Diffraction (TKD) analysis
• Elemental analysis from carbon to uranium
Electron probe microanalyzer (EPMA) – JEOL JXA-8530F Plus

- High-end EPMA system for qualitative and quantitative elemental microanalysis
- Field emission gun (FEG)
- Acceleration voltage: 1–30 kV
- Detectors: SE, BSE
- EDS detector (JEOL)
- Five WDS detectors
- Dedicated WDS crystal for trace carbon and nitrogen analysis of steel specimens
- Elemental analysis from beryllium to uranium
- Smallest detectable element concentration: 10 ppm
- Integrated plasma cleaner and cold trap for contamination control
Focused Ion Beam – FEI Helios 600 Dual Beam FIB-FESEM

- Ga ion gun
- Integrated FESEM
- Detectors: two SE, one STEM
- EDS detector for elemental analysis (Oxford Instruments)
- Elemental analysis from carbon to uranium
- FESEM and STEM imaging
- Fabrication of TEM specimens
- 3D imaging (microtomography)
Transmission Electron Microscope (TEM) – JEOL JEM-2200FS EFTEM/STEM

- High-performance and versatile material science TEM
- Integrated energy filter (EFTEM)
- Scanning Transmission Electron Microscopy (STEM)
- Piezo-controlled goniometer
- Specimen holders: single tilt, analytical single tilt, analytical double tilt, four specimens, tomography
- Field emission gun (FEG)
- Acceleration voltage: 80–200 kV
- HR imaging (TEM and STEM)
- Resolution: 0.1 nm (lattice), 0.23 nm (point-to-point), 0.2 nm (STEM)
- Energy Dispersive Spectroscopy (EDS) and Electron Energy Loss Spectroscopy (EELS) elemental analysis
- Electron diffraction: SAD, CBED, NBD, PED (Precession Electron Diffraction)
- Tomography: TEM, STEM, diffraction
- Software for processing EDS, EELS, electron diffraction and tomography data
X-ray diffraction (XRD) – Rigaku SmartLab 9kW

- Computer controlled instrument with high level of automation
- High performance XRD system with 9 kW rotating anode x-ray generator
- Co and Cu anodes
- Cross Beam Optics (CBO): Parallel Beam (PB) and Bragg-Brentano (BB) optics
- CBO-f Polycapillary Microfocus Optics for CBO (400 µm x-ray spot)
- Detectors: 1D solid state detector and scintillator
- Vertical θ/θ 4-circle goniometer with Eulerian cradle
- The in-plane diffraction measurement option for measuring of planes parallel to the sample surface. Optimal e.g. analysis of ultra thin films.
- Anton Paar DHS1100 furnace for in-situ sample heating XRD experiments (RT-1100 °C)
- Atmospheres: Air, inert gas, N₂, vacuum
- Solid and powder specimens
- Analysis of crystal structure, phase content, residual stress, dislocation densities, and texture
X-ray photoelectron spectroscopy (XPS) –
Thermo Fisher Scientific ESCALAB 250Xi

• High-performance surface analysis platform with multi-technique capability
• Elemental analysis from lithium to uranium
• Smallest detectable element concentration: 100 ppm

• System characteristics:
  - XPS imaging
  - Angular resolved XPS (ARXPS)
  - Ar⁺-gas cluster ion gun for chemical depth profiling and sample cleaning (mono ion and cluster modes)
  - Sample heating and cooling
  - Reflection electron energy loss spectroscopy (REELS)
  - Ion scattering spectroscopy (ISS)
  - Ultraviolet photoelectron spectroscopy (UPS) (valence band and Fermi edge studies, etc.)
  - Sample transfer vessel for air-sensitive samples
X-ray fluorescence (XRF) – PANanalytical Axios\textsuperscript{max}

- Computer controlled system
- Qualitative and quantitative chemical analysis
- Automatic sample changer
- Solid and powder specimens
- Wet specimens
- Elemental analysis from fluoride to uranium
- Smallest detectable element concentration: 10 ppm
Glow-discharge optical emission spectroscopy (GDOES) – Spectruma Analytik GDA 750

- Bulk analyses and depth profiles
- All elements can be detected (including H, O, N, Cl, C)
- Bulk analysis: Cu- and Al-alloys, Low alloy steels and CrNi-steels
- Universal method for depth profiling, max depth 200 µm, resolution 1-5 nm
- 28+4 fixed analytical element channels (PMT)
- Detection limit: 1 – 10 ppm
- DC excitation for metals
- RF excitation for non-conductive materials and coatings
Simulation software

- Thermo-Calc, Dictra, TC-Prisma
- JMatPro
- EBSD-software
- Abacus, Matlab, MatCad, CATIA, Intel Fortran Compiler, etc.