

High Performance Liquid Chromatography (HPLC)

Make: Waters™ Model: 1525 Year of Installation: 2012

Features

- Binary HPLC pump
- **Detectors**
 - Photodiode array detector
 - UV/visible detector
 - Refractive index detector
 - ELS detector
- **Columns**
 - OD-H (4.6mm ϕ × 250mmL, particle size = 5 μ m)
 - AD-H (4.6mm ϕ × 250mmL, particle size = 5 μ m)
 - SunFire™ C18, 5 μ m, 4.6 × 250mm
 - Atlantis® T3, 5 μ m, 4.6 × 250mm



Applications

- Separation of different component of drugs/metabolite in plasma/serum/synthetic mixture/pesticide/trace organic /PAHs etc.
- Detection of impurities in pharmaceutical industries
- Pre-concentration of trace components
- Ligand-exchange chromatography
- Ion-exchange chromatography of proteins
- High pH anion-exchange chromatography of carbohydrates and oligosaccharides
- Water purification

Gas Chromatography Mass Spectrometry (GCMS)

Make: SHIMADZU Model: QP 2010 ULTRA Year of Installation: 2014

Features

- Auto-sampler for automated sample handling.
- Direct injection (DI) probe
- Availability of Headspace GC
- **Detectors**
 - Flame ionization detector (FID)
 - Electron capture detector (ECD)
 - MS detector
- **Columns**
 - Rt[®]-bDEXsm (30 m, 0.25 mmID, 0.25 μ m df), max. Prog. temp. = 230 °C
 - Rtx[®]-5Sil MS (Crossbond[®], selectivity similar to 5% diphenyl/95% dimethyl polysilox), 30 m, 0.25 mmID, 0.25 μ m df), max. Prog. temp. = 320 °C



Applications

- Structural elucidation of organic compounds
- Study of fragmentation process
- Molar mass and structural analysis of small biomolecules
- Environmental, flavours, fragrances, forensic, pharmaceuticals, organic, chemical, and petrochemical samples
- Isotopic abundance
- Molecular structure
- Nominal molecular weight calculations
- Impurities in drinking water, and waste water
- Used to detect elements like chlorine, bromine, sulphur, silicon, and boron

X-ray Diffractometer

Make:  Model: D8Advance

Year of Installation: 2018

Available modes for Use:

- Bragg Brentano Geometry (Powder Diffraction)
- Parallel Beam Geometry (Thin Film)
- Transmission Mode (Small Angle)

Stages Available:

- Rotating Sample Stage
- Compact Cradle
- Capillary stage

Primary Optics:

- Fixed and Motorized Slits
- Parallel beam and focusing Gobel mirrors
- Universal Beam Concept (UBC) collimators
- Soller Slits

Secondary Optics:

- Fixed and Motorized Slits
- Equatorial Slits
- Ni Filter
- Soller Slits



Application/Information:

- Phase Composition (Qualitative & Quantitative)
- Crystal Structure
- Residual Stress
- Microstructures
- Lattice Parameters
- Percent Crystallinity
- Amorphous Content

X-ray diffraction system capable of characterizing bulk materials, powders, thin films at ambient conditions.

What we don't get

- **Elemental analysis**
is there iron in sample or not
how much boron in the sample
what elements are present in the sample
- **Tell me what this sample is ???**
unless you don't know something about the sample, XRD won't have answer !!!

- Which minerals are present?
- Is it polymorph A or B?
- Is the sample amorphous?
- What is the product of my synthesis?

Qualitative phase analysis

Basic Powder Diffraction

- How much retained austenite?
- Do I have less than X% of calcite?
- How much impurity is left?

Quantitative phase analysis

- How big are the crystallites?

microstructure

- How much Pb is in the sample?
- How big are my particles?
- How are the inclusions distributed in 3D?

XRD not appropriate

Consider other techniques

Specialized XRD

- How thick are the layers on my wafer?
- Which crystal phases are in my coating?
- How much is the residual stress?

HRXRD, GID, stress & texture, ...

Features

Two Theta range: 0-154 degrees
X-ray generator: 40 kV and 40 mA
Cu anode X-ray tube: Line Focus and Point Focus
X-ray Wavelength: 1.54 Angstrom (Cu K alpha)
Detector: LYNXEYE XE (0 D, 1 D and 2D)

Softwares:

- DIFFRAC.EVA for general analysis
- TOPAS for refinement (Rietveld)
- LEPTOS for residual stress, GIAXRD (Thin films)
- Small Angle X-ray Scattering (SAXS)
- TEXTURE for preferred orientation

Field Emission Scanning Electron Microscope (FESEM) and Energy Dispersive Spectrometer (EDS)

Make:  Model: **JSM 7610 F Plus**

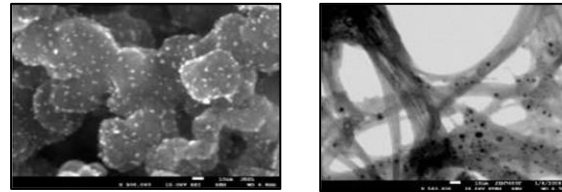
Year of Installation: **2020**

- Resolution: 0.8 nm (15 kV), 1.0 nm (1 kV GB mode)
- Accelerating Voltage: 0.1 to 30 kV
- Probe Current: A few pA to 200 nA
- Magnification: 25 to 1,000,000 X
- Electron Gun type: In lens Schottky Field-emission gun
- Lens System: Condenser Lens, Aperture angle control lens, semi-in lens objective lens
- Feature: Gentle Beam, A semi-in-lens objective lens
- Detector: SEI, LEI and RBSEI
- Energy Filter: new r-filter
- Gentle Beam: Built-in
- Specimen Stage: Eucentric, 5 axis motor control
- WD: 1.0 mm to 40 mm
- Tilt: - 5° to + 70°
- Evacuation System: Two SIPs, TMP, RP
- Ultimate Pressure: Gun Chamber: Order of 10^{-7} Pa
- Specimen Chamber: Order of 10^{-4} Pa

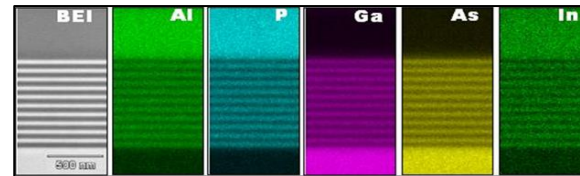
JSM-7610F Plus is an ultra high resolution Schottky Field Emission Scanning Electron Microscope has **semi-in-lens objective lens**. High power optics can provide high throughput and high performance analysis. It's also suitable for high spatial resolution analysis. Furthermore, **Gentle Beam mode** can reduce the incident electron penetration to the specimen, enabling to observe at topmost surface by using a few hundred landing energy.

Features:

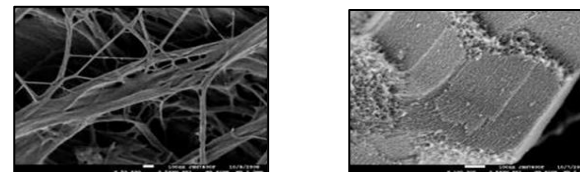
- **High resolution imaging and high performance analysis by semi-in-lens objective lens**



- **High Spatial resolution analysis by semi-in-lens objective lens**



- **Top most surface imaging at ultra low landing energy by Gentle Beam mode (GB)**



Applications:

- 3-D topographic imaging
- Micro structure of different materials (grain size, phase identification)
- Atomic contrast imaging by Retractable backscattered electron imaging (RBSEI) detector
- Topographic high resolution imaging of materials by Secondary electron Imaging (SEI) detector
- High depth of field imaging by Low Energy Imaging (LEI) detector
- Gentle beam mode for soft materials (Organic)
- Elemental distribution by EDS (spot/Line/area mapping)
- Quantification of elements by ZAF method with EDS system



Elemental Energy Dispersive Spectrometer System (EDAX Make)

Specification:

- Silicon Drift Detector (30 mm²)
- Silicon Nitride Window of 100 nm thickness
- Resolution: 129 eV for Mn K-ray
- Detection range: Be – Am (Z=4 to Z=95)
- Peak/Background: >10,000/1
- Thermoelectric Peltier cooling (fan and LN free)



EDS system is supported by **Apex™ Advanced software**: For quantification and analysis of the spectrum

Microprocessor Controller Muffle Furnace

Make: METREX

Model: MF-14P

Year of Installation: 2020



Centrifuge (Non-refrigerated)

Make: Eppendorf

Model: 5430

Year of Installation: 2021



Workstation (High End Computer System)

Make: Dell

Model: Dual Intel Xeon Silver
4215

Year of Installation: 2022

