

Central Instrument Facility (CIF) - List of equipment

Life Science¹

Mass Spectrometry

1. GC/MSMS - Thermo Scientific TSQ 8000 Evo Triple Quadrupole GC-MS/MS, equipped with automatic liquid sampler and EI and CI sources.
2. GC/MS - Agilent 5973N Mass Selective Detector interfaced to a 6890 gas chromatograph which is equipped with a 7683 automatic liquid sampler EI and CI sources.
3. Thermo-Finnigan LTQ LC/MS-MS linear Ion-trap mass spectrometer with ESI source that is interfaced to HP-1100 HPLC.
4. LC/TOF-MS (accurate mass) Agilent 6220 time-of-flight mass spectrometer (OTOF) interfaced to an Agilent 1200 HPLC with electrospray, multi-mode (ESI/APCI), APPI and DART sources.
5. LC/TOF-MS (accurate mass) Agilent 6224a time-of-flight mass spectrometer (BTOF1) interfaced to an Agilent 1290 Infinity UHPLC with electrospray, multi-mode (ESI/APCI) sources.
6. LC/TOF MS, it is a 6230B Agilent time-of-flight mass spectrometer (BTOF2) interfaced to an Agilent 1290 Infinity UHPLC with electrospray, multi-mode (ESI/APCI) sources.
7. LC/QTOF-MS-MS (accurate mass) Agilent 6510A quadrupole time-of-flight mass spectrometer (QTOF) interfaced to an Agilent 1200 HPLC with electrospray, multi-mode (ESI/APCI) sources
8. LC/TOF-MS (accurate mass) Agilent 6224 time-of-flight mass spectrometer (MTOF) interfaced to an Agilent 1260 HPLC with electrospray and multi-mode (ESI/APCI) sources.
9. Thermo GC-TSQ8000 Evo triple quad with EI and CI ionization
10. Waters Xevo UPLC-MSMS triple quad with ESI ionization

NMR Spectroscopy

11. Agilent (Varian) 400MR equipped with Automated Tuning and a 7600 Sample Changer.
12. Agilent Inova 400 equipped with proton detected multi-nuclear and quad-tuned probes. Extended VT range.
13. Agilent Inova 300 equipped with quad-tuned (1H, 19F, 13C, 31P) probe. Extended VT ranged.
14. Agilent Inova 500 with three channels, 3-axis gradients and many other accessories including HCN, broadband probes and a NANO (hrmas) probe.
15. Agilent Inova 600 with four channels, 2H decoupling, 3-axis gradients and many other accessories including HCN and a flow-probe.

UV-Vis-IR Spectroscopy

16. Nicolet iS-50 FT-IR spectrometer with ATR-ZnSe for thin films, powders and liquids; Harrick Grazing Angle Reflectance Accessory for thin films on metal or semiconductor substrates; Gemini Diffuse Reflectance Accessory for non-reflecting powder materials.
17. Spectra-Tech Continuum Microscope to record reflectance and transmission IR of small particles, 10microns or larger.
18. Agilent (Cary) UV-Vis-NIR equipped with VASRA or Variable Angle Specular Reflectance Accessory that is used with thin films at angles from 20 to 70 degrees; Praying Mantis diffuse reflection analysis of solids and powders.
19. Malvern Zetasizer Nano ZS with 633nm 'red' laser- for size measurement of particles and molecules (e.g. proteins) dispersed in a liquid (using dynamic light scattering, DLS); zeta-potential of colloids and nano particles for predicting dispersion stability (using electrophoretic light scattering); and the measurement of microrheology of protein and polymer solutions. The high performance of this instrument also enables the measurement of molecular weight of macromolecules.
20. Horiba Jobin-Yvon FluoroLog-3 Spectrofluorometer with 450W Xenon lamp (230-1800nm), excitation and emission spectrometers- High sensitive, modular spectrofluorometer for fluorescence measurements in the 240 to 850nm emission spectral range.
21. Fluorescence microscope.

¹ Life, Material and Surface Science groups specialties help to characterize the major focus of instruments in their respective groups. There are obvious and substantial overlaps of instruments among the groups.

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Materials and Surface Science²

EM and Surface Analysis

1. JEOL JSM-6500F field emission scanning electron microscope (FESEM) with EDS, Lithography and PelCo STEM-in-SEM.
2. JEOL JEM-2100F transmission electron microscope (TEM) with HR pole piece, STEM and ED cameras.
3. Bruker Contact Profilometer
4. Nanoscience-2 AFM
5. Woolam VASE or Variable Angle Spectroscopic Ellipsometer, with 250-1700nm spectral range- used to measure the thickness, refractive index and other optical properties of thin films and multi-layer films.
6. Kruss DSA10 Drop Shape Analyzer Contact Angle Goniometer (CAG)

Magnetic Properties

7. Quantum Design PPMS – 9T, DC Resistivity, Electrical Transport, Vibrating Sample Magnetometer (VSM), Thermal Transport, Heat Capacity, Horizontal Rotator, Multi-Function Probe, VT from 1.8 K to 1000 K
8. Quantum Design MPMSXL – 5T supercon with SQUID AC susceptibility, Reciprocating Sample Option (RSO) for DC field measurements, VT from 1.8 K to 400 K
9. Quantum Design ATL-160 – 20 liter per day liquid helium direct recovery system
10. Agilent Inova 400 equipped with 3mm XH CP-MAS, 20kHz rotors
11. Bruker ESR-300 spectrometer with various cavities for spin counting and very high temperature studies plus liquid helium cooled cavity for sub-10K studies.

Thermal Analysis

12. TA Modulated 2920 DSC with sub-ambient accessory. Measured properties include glass transition, melting points, % crystallinity, heats of fusion, specific heat, kinetics, stability, purity and cure rate.
13. TA TGA 2950 Thermogravimetric analyzer measures thermal stability, decomposition kinetics and volatile components of materials.
14. TA DEA 2970 with sub-ambient accessory measures capacitance and conductance of material as a function of temperature and frequency. One may measure permittivity, loss factor, tan delta and ionic conductivity of materials.

X-ray Science

15. PE-5800 X-ray Photoelectron Spectroscopy (XPS), also known as Electron Spectroscopy for Chemical Analysis (ESCA) with Scanning Auger Microscopy, sputter depth profiling and UPS.
16. Bruker D-8 Discover Diffractometer with Parabolic Göbel mirror for parallel and monochromatic beam, ¼-circle Eulerian cradle, Equipped with 4-Bounce monochromator capable of HRXRD, XRR and GAXRD.
17. Bruker D-8 Discover – DAVINCI with Flip-Stick sample stage, Lynx-Eye Detector, Diffrac-EVA, TOPAS and other software for powder XRD, adaptable for thin film measurements
18. Bruker D-8 Discover – theta-theta mode, Göbel mirror, Cu radiation, Lynx-Eye detector upgrade
19. Scintag X-2 Powder X-Ray Diffractometer (PXRD).
20. Bruker APEXII single-crystal diffraction system.
21. Rigaku Wide Angle X-ray Scattering (WAXS)/Small Angle X-ray Scattering (SAXS).

Electronics Shop – fully equipped and engineer-staffed with expertise in digital, analog and RF design and troubleshooting

Staff Scientists – seven PhD scientists cover all major instruments, provide expertise for student training and full collaborations as may be needed or desired.

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