Department of Chemistry
Faculty of Exact Sciences
Bar-Ilan University

Chemistry Scientific Equipment Center

The Chemistry Scientific Equipment Center is equipped with state-of-the-art instruments and technology dedicated to serving researchers and industry with support by experienced PhD-level experts.

Nuclear Magnetic Resonance (NMR)

The NMR unit is one of the largest in Israel and includes six Bruker spectrometers from 4.7 to 16.4 T corresponding to proton (^{1}H) frequencies of **200 to 700 MHz**. Probes are available for most useful nuclei at a wide range of temperatures suitable for both 1D and 2D experiments. Two instruments (200 and 500 MHz) are dedicated to the study of solids. The 700 MHz spectrometer is equipped with a high-sensitivity cryoprobe for high resolution including protein studies.

Mass-Spectrometry (MS)

GC-MS, HPLC-MS, and TGA-MS Agilent/Perkin Elmer instruments provide a variety of quantitative and qualitative analyses including HRMS and MS/MS for synthetic and natural solutions, gases and solids. Professional consultation and interpretation are provided upon demand.

Elemental Analysis

CHNS for carbon, hydrogen, nitrogen and sulfur composition determination using a Vario UNI¬CUBE analyzer for simultaneous analysis.
Inductively-Coupled Plasma (ICP) for elements including halogens (Cl/Br/I) by a Multi-View SPECTRO ARCOS ICP-OES.

Raman Spectrometry

Horiba LabRAM Soleil and Renishaw InVia confocal micro-Raman systems provide detailed information about chemical structure, phase and polymorphs, crystallinity and molecular interactions using 325/532/785 nm lasers with an XY-motorized sample stage and Z-motorized focusing for mapping. Raman and photoluminescence measurements are provided in various morphologies and phases for gas, solid, powder and liquid (including water) samples.

X-Ray Diffraction (XRD)

Analyses of the structure and composition of crystalline phases in powders are performed with Bruker D8 Advance and Malvern-Panalytical Aereis XRD instruments. Reflection, transmission, GIXRD and temperature-controlled (up to 150 °C) measurements are available.

X-Ray Photoelectron Spectroscopy (XPS)

A Nexsa G2 XPS instrument (Thermo Fisher Scientific) with high lateral resolution analysis (down to 10 µm) provides chemical composition of solid surfaces including relative concentrations and chemical forms of elements (except hydrogen), depth profiling, and reflection electron energy loss spectroscopy (REELS).

Electron Paramagnetic Resonance (EPR)

The EPR center applies an advanced Bruker instrument and a CW-ElexSys 500 spectrometer for X and Q band (4–300 K) along with a pulse SpinFlex MRLab (X band, 4–300 K) situated at the Technion for radicals, proteins, antioxidants, electrochemistry, organometallic chemistry and holes/defects in nanomaterials.

Circular Dichroism (CD) Spectroscopy

A Chirascan (Applied Photophysics) instrument provides a deeper understanding of biomolecular characteristics, mechanisms and interactions of chiral molecules.

BET

A Quantachrome NOVA device provides measurements for surface area, pore volume, pore radius and adsorption-desorption isotherms for solids and powders.

Thermogravimetric Analyzer / Differential Scanning Calorimetry (TGA/DSC)

TGA measures the mass loss of a sample as a function of temperature and time. The temperature can be programmed up to 1000 °C at a chosen increase rate (or isothermal) under air or in an inert environment (nitrogen). A complementary DSC heat flow sensor (Mettler Toledo) simultaneously detects thermal events such as melting or crystallization and provides accurate and precise transition temperatures.

Dynamic light scattering (DLS) and ζ potential

The ZS Malvern Zetasizer provides the size distribution profile of small nanoparticles (NPs) in suspension or polymers in solution by DLS between 0.6 nm to 6 µm and the Zeta potential (surface charge) of NPs in the range of 5 nm to 10 µm.

Molecular Modeling and Computer-Driven Materials Design

Molecular modeling software has proven potential for streamlining and optimizing development of pharmaceuticals and nanomaterials. An advanced computational platform, on both hardware and software level, enables a wide variety of structural and energetic calculations (quantum computations, energy minimization, conformational searches, molecular dynamics, anchoring, statistical modeling and more) on systems ranging from atomic level to crystal lattice cell unit. Calculations are carried out by several research groups with many years of experience in computational chemistry, in both academia and industry.

For more details: https://ch.biu.ac.il/node/719