
Instruments

Dynamic Light Scattering (DLS) – Malvern Zetasizer Red ULTRA

The most advanced instrument on the market for determining hydrodynamic radius, Zeta potential, particle concentration, and molecular weight. It is the most comprehensive option in the Zetasizer family. All measurements are performed at 25 °C, with the option to vary the temperature between 0 and 100 °C. For analyses, users must specify the dispersion medium, and if not common (e.g., water or buffer), also its viscosity and refractive index.

Measurement angles: Back scatter (173°), Side scatter (90°), and Forward scatter (13°)

Key features and possible analyses:

- **DLS**: Measures size of dispersed systems and/or proteins from 1 nm to 1 µm (available at all angles).
- **Electrophoretic Light Scattering**: Measures Zeta potential of dispersed systems and/or proteins, providing an index of stability and aggregation tendency. Zeta potential distribution is not provided if conductivity exceeds a set threshold.
- **MADLS (Multi-Angle DLS)**: High-resolution determination of nanoparticle size for monodisperse samples and separation of size populations.
- **Particle Concentration**: Measurement of concentration for monodisperse samples and/or proteins (nanoparticles/mL).
- **Molecular Weight**: Determination of molecular weight of dispersed systems and/or proteins. Sample must be concentrated enough to allow at least 5 dilutions for curve construction.

Sample prerequisites for MADLS and Particle Concentration:
Samples must be monodisperse and dilute to a maximum volume of 1 mL. MADLS and Particle Concentration measurements are independent of the sample size measurement in backscatter mode.

ANP ParticleWorks (now Unchained Labs)

A system for producing nanoparticles or nanosystems via precision microfluidics. It operates with high-stability pumps, adjustable flow rates, volumetric tubing, and quartz chips with different geometries (channel sizes between 100 and 275 µm, under laminar or turbulent flow).

It allows preparation of sample volumes ranging from 200 µL to several liters, with high scalability and experimental reproducibility.

The system enables inline dilution using a second microfluidic chip and trimming of front and tail fractions during sample collection to optimize monodispersity. Syntheses can be carried out at room temperature or higher, using a thermostatic bath.

Atomic Force Microscope – Park NX7

A complete Atomic Force Microscopy system for small- to medium-sized samples. The system includes a manual X-Y stage for high-precision positioning and a motorized Z stage. Available modes include True Non-contact™, Tapping, Phase Imaging, Contact, Lateral Force Microscopy, Kelvin Probe Force Microscopy, and spectroscopic analysis like force-distance curve acquisition.

The True Non-Contact™ mode significantly reduces tip and sample wear, enabling non-destructive analysis and high-resolution imaging of sensitive materials. NX7 features active and passive vibration isolation for stable, reliable measurements even in suboptimal environments. Cantilevers are available for liquid measurements and nanomechanical testing in mapping mode.

PalmSens 4 Potentiostat

A high-end portable potentiostat/galvanostat for laboratory and field electrochemical applications. It includes an optional Frequency Response Analyzer (FRA) for Electrochemical Impedance Spectroscopy (EIS), offering a wide range of potentials and currents with high resolution and low noise.

Applications: surface characterization, redox studies of organic/inorganic species, and detection of targets in various matrices.

Specifications:

- Potential range: ±5 V or ±10 V
- Current range: 100 pA to 10 mA (9 ranges)
- Potential resolution: 76.3 µV (18-bit)
- Current resolution: up to 5 fA (0.005% of range)
- Potential accuracy: ≤0.1% ±1 mV

- Current accuracy: ≤0.1% of full range
- EIS frequency range: 10 µHz to 100 kHz or 1 MHz (depending on configuration)
- AC amplitude for EIS: 1 mV to 0.25 V RMS
- Acquisition rate: up to 150,000 points/sec

Supported techniques:

- **Voltammetry**: LSV, CV, DPV, SWV, NPV, ACV
- **Amperometry**: CA, MPAD, FAM
- **Potentiometry**: OCP, MP
- **Galvanostat**: CP
- **Impedance spectroscopy**: EIS and GEIS (potentiostatic and galvanostatic)
- **Mixed modes**: Advanced combinations of techniques

QCM-R – Quartz Crystal Microbalance

A quartz crystal microbalance designed to measure mass changes and viscoelastic properties of thin films and functionalized surfaces. It uses the piezoelectric effect to detect frequency shifts due to mass adsorption or desorption on the crystal surface.

Specifications:

- Resonance frequency: typically 5 MHz or 10 MHz
- Mass sensitivity: up to 1 ng/cm²
- Frequency resolution: 0.01 Hz

Typical applications:

- **Biosensors**: Real-time detection of biomolecular interactions
- **Materials chemistry**: Study of thin film deposition and corrosion

- **Pharmaceuticals**: Drug-receptor binding analysis, formulation development
- **Environmental**: Monitoring air contaminants and air quality

Time-of-Flight Secondary Ion Mass Spectrometry – PHI NanoTOF II (ToF-SIMS) An advanced surface chemical analysis instrument with extremely high sensitivity and spatial resolution. A focused primary ion beam induces the emission of secondary ions from the sample surface, which are then analyzed by a time-of-flight mass spectrometer based on their mass-to-charge ratio.

The NanoTOF II provides 2D and 3D chemical maps (depth profiling) with lateral resolution down to 100 nm and sensitivity in the ppm-ppt range. It is particularly suitable for the study of biological samples, complex materials, thin coatings, surface contamination, and microelectronic devices.

The instrument features a Bismuth primary ion source (LMIG) and is equipped with O_2 and Ar Gas Guns for sputtering. Samples must be compatible with high vacuum conditions.

DSC 2500

Last generation differential scanning calorimeter with registered TZero® (TA Instruments) technology. The instrument is equipped with RCS90 refrigerating system, that can reach its lower temperature at – 90 °C. With this equipment it is possible even to run modulated DSC experiments.

SDT-Q600

The simultaneous thermal analyzer measures simultaneously the TGA/DSC or TGA/DTA, dependently from the crucible type and so from the analyzed sample. The instrument can reach the 1000 °C (with Pt crucible) or 1500 °C (with alumina crucible), under controlled atmosphere, selecting from inert (N 2) or oxidizing (air) one.

Discovery Hybrid Rheometer-2

New generation rheometer that allows a whole type of mechanical analyses on solutions, suspensions, emulsions, soft materials and even on solid samples (this last type only in compression regime). The instrumental configuration and accessories allow to operate shear and compression tests, and even tribological tests.

AR-2000ex

Rotational rheometer that allows mechanical analysis on liquids, soft matters and even on solid samples. The present configuration of the instrument for the temperature control is

configured with a traditional Peltier plate or with the Environmental Testing Chamber (ETC), to perform mechanical analyses on solid samples, in shear regime.