

Product Overview

- Advanced Analytical Solutions

We Exceed Your Expectations

Professional Competence

Bruker is a worldwide market leader in providing advanced X-ray and optical emission solutions for structure and elemental analysis using X-Ray Diffraction (XRD), X-Ray Fluorescence (XRF/OES) and crystallographic diffraction techniques. We also offer the world's largest selection of AFMs, stylus profilers, and 3D optical microscopes to enable nano- to macro-scale surface measurements for a wide range of academic research and industrial process applications. Our microtomography desktop instruments even enable you to non-destructively acquire 3D images of your sample's morphology and internal microstructure with resolutions down to the sub-micron level.

Our products fit the analytical requirements of customers in materials research, life science, quality control, and process analysis. They provide essential information about the molecular structure, material and structural parameters of thin film and bulk material as well as elemental composition of solids and liquids.

High Performance

Bruker X-ray systems emphasize modularity and flexibility, enabling an entry-level system to be reconfigured or upgraded to meet changing requirements. We offer the widest available variety of X-ray sources, optics, sample environments and detectors, along with expert advice on configuring the optimal system. All of our systems and solutions are easy to operate, robust and compact, with degrees of automation ranging from none to one-button operation. Professional training and worldwide service is in place to support the customer.

A History of Innovation Leadership

Bruker is constantly redefining the performance and quality standards in X-ray analysis. Breakthrough innovations and continuous improvements on established techniques provide our customers with analytical possibilities that were considered beyond reach only a short while ago. Examples include our revolutionary detection technologies, multilayer X-ray optics, and ability to perform XRF analysis of light or trace elements. Further accomplishments are highlighted at the bottom of this and the following pages.

X-Ray Diffraction Solutions

Bruker sets new standards. Innovative sources and detectors ensure breathtaking speed at high sensitivity at best resolution – without sacrificing reliability and flexibility. Bruker AXS' Diffraction Solutions enable unprecedented throughput in research and development.

- High-brilliance TURBO X-RAY SOURCE and METALJET
- VANTEC-1 detector – instant diffraction snapshots
- LYNXEYE™ detector family – rapid powder diffraction
- EIGER2 R 500K: The next generation HPC detector
- PILATUS3 HPC detector for count rate sensible measurements
- VANTEC-500 detector – the extra dimension of XRD²

X-Ray Diffraction (XRD)

XRD



XRD for Everyone

X-ray diffraction expands analytical capabilities down to the nanometer range. Our highly accurate, reliable and fast diffraction solutions are accompanied by an intuitive and clearly laid-out user interface, easy handling, and individual data presentation, as well as perfect integration and communication capabilities.

Premium Class Diffraction Solutions

The D8 DISCOVER enables cutting edge research into the frontiers of nanotechnology and materials research by offering the most powerful sources and largest sample stages available.

Applications

- Crystalline phase identification
- Crystalline phase quantification
- % crystallinity
- Crystallite size determination
- Crystal structure analysis
- Crystal orientation
- Texture and preferred orientation
- Microstrain
- Residual stress
- Layer thickness
- Layer roughness
- Lattice parameter
- Chemical composition
- Lateral structures
- Defects
- Reciprocal space mapping
- Microdiffraction
- Depth profiling
- Polymorph screening
- High temperature
- Low temperature
- Humidity
- Phase transition
- Nanoparticles

Plan. Measure. Analyze

Bruker X-ray diffraction solutions are designed for both novice and expert users. The DIFFRAC.SUITE software platform, an interface shared across the spectrum of solutions, provides the perfect balance of ease-of-use and full instrument control.

- Tool-free hardware reconfiguration
- Intelligent method creation
- Push button method execution
- Accessible analysis software

X-Ray Diffraction (XRD)



X-Ray Sources

Designed for maximum uptime with minimal maintenance

TXS-HE

For applications demanding maximum signal and minimal collection time

$\text{I}\mu\text{S}^{\text{HB}}$

Air cooled, high brilliance source ideal for microdiffraction



X-Ray Optics

Push-Button multiple path optics offer ideal beam conditioning with ultimate ease of use

TWIN

Motorized Slit for powder diffraction
Parallel Beam for coating analysis

TRIO

Motorized Slit for powder diffraction
Parallel Beam for coating analysis
High resolution $\text{K}\alpha_1$ for epitaxial thin films



X-Ray Detectors

Bruker has always been a leader in detector technology.

LYNXEYE XE-T

Unmatched energy discrimination offering best performance for powder diffraction

EIGER2 R 500K

Unrivaled 0D/1D/2D integration for multipurpose materials research laboratories

DAVINCI Design

A pioneering diffractometer concept which eliminates the problems of awkward configuration and adjustments.

- DAVINCI.SNAP-LOCK: alignment- and tool-free optics change
- DAVINCI.MODE: real-time component recognition, configuration and conflict detection
- DIFFRAC.DAVINCI: digital representation of the physical diffractometer components

Nanostructure Analysis



NANOSTAR



N8 HORIZON

XRD
Materials
Research
SAXS

Enter the universe of nanostructure analysis

The innovative Small Angle X-ray Scattering (SAXS) systems N8 HORIZON and NANOSTAR are ideal tools for the non-destructive characterization of nanostructures on the order of 10 to 1000 Ångstroms, such as precipitates in bulk materials, proteins in solution, and nanoparticles attached to a surface.

Applications

- Small Angle X-ray Scattering (SAXS)
- Wide Angle X-ray Scattering (WAXS)
- BioSAXS
- Grazing Incidence Small Angle X-ray Scattering (GISAXS)
- Nanography
- Particle size and shape
- Particle size distribution
- Orientation distribution
- Particle distances
- High and low temperature

Göbel and MONTEL Mirror

The highest performance can only be achieved with the most modern instruments. With the invention of the Göbel Mirror, Bruker raised the standards for diffraction and SAXS. Göbel Mirrors are X-ray optics with incomparable precision. Particularly in combination with high-brilliance micro focus (I μ S) or rotating anode (HB-TXS) X-ray sources, and liquid metal METALJET sources, a beam with high flux on a small spot is generated.

- Maximum flux
- Perfect beam homogeneity
- Highest spectral purity
- Bragg-Brentano, parallel beam, or focusing geometries
- High flux densities for μ XRD applications

X-Ray Fluorescence Analysis (XRF)

Measuring a World of Elements in Seconds

X-ray fluorescence spectrometry is the most effective way to perform multi-elemental analysis determining concentrations in solids, powders and liquids. Bruker's Energy Dispersive X-ray Fluorescence (EDXRF) systems use renowned XFlash silicon drift detectors with active areas of up to 100 mm² to offer the highest analytical precision and stability.

The S2 PUMA with TouchControl™ provides you with instant answers for element concentrations from C to Am in unknown samples. The S4 T-STAR® and the S2 PICOFOX use Total Reflection X-ray Fluorescence (TXRF) for ultra trace element analysis down to the ppt range, and are consequently an alternative to ICP or AAS.



S2 PICOFOX



S4 T-STAR®



S2 PUMA

Applications

- Fresh water, sea water
- Sewage, sludge
- (Bio-) Pharmaceuticals
- Blood, urine
- Proteins, macromolecules
- Food, dietary supplements
- Wine, beverages
- Nanoparticles and -layers
- Wafer analysis
- Contaminations
- Aerosols
- Thin films



XFlash® LE
SDD Detector

Applications

- Petrochemicals
- Minerals and mining
- Slags
- Cement
- Geology
- Pharmaceuticals
- Metals and alloys
- Soil, sediments and waste

HighSense LE Silicon Drift Detector

The HighSense™ LE detector further expands the application range of Benchtop EDXRF systems. Due to an ultra-thin high-transmission entrance window the HighSense LE SDD with 50 W excitation power eliminates conventional limitations of EDXRF systems and significantly enhances the sensitivity for light elements. In addition, the HighSense LE SDD achieves super-high count rates due to ultra-fast signal processing, leading to short measurement times and excellent analytical precision.

Unrivalled Analytical Performance

Our Wavelength Dispersive X-Ray Fluorescence (WDXRF) systems provide you with excellent analytical results for elements from Be to U in your samples. They feature high accuracy and the best achievable precision for effective process and quality control. They are reliable and robust for all industrial applications, yet flexible and powerful for all non-routine applications in research and development.



S2 KODIAK
Online XRF

Real-time Elemental Analysis for Mining and Coating

The new online multi-element analyzer S2 KODIAK uses X-ray fluorescence spectrometry to analyze the elemental concentrations in ores and other materials on conveyor belts in real time. Information about the element concentrations and layer thickness is immediately available with the S2 KODIAK, helping to optimize production steps.

XRF² Small spot mapping

Element mapping and particle analysis are most important for troubleshooting in production and material research. The XRF² mapping tool of the S8 TIGER Series 2 offers unrivalled analytical performance: With 300 μm minimum spot size (FWHM) and 100 μm step size, the S8 TIGER sets the benchmark for this kind of instrumentation! Using the WDXRF goniometer, the S8 TIGER delivers better resolution and more efficient light and heavy element detection than any other bulk WDXRF system with mapping capability.

Smallest Spot Size

- 300 μm spot
- 100 μm step size (HD mapping alternatively)

WDXRF Performance

- Best light element analysis and optimal heavy element detection
- High WDXRF resolution



S8 LION
Simultaneous WDXRF



S8 TIGER
Sequential WDXRF

Applications

- Petrochemicals
- Plastics and polymers
- Cement
- Geology
- Metals and alloys
- Precious metals
- Minerals and mining
- Glass and ceramics
- Chemicals and catalysts
- Pharmaceuticals
- Soil, sediments and waste
- Foods

XRF
TXRF
EDXRF
WDXRF

Micro-X-Ray Fluorescence Analysis (MXRF)



MXRF is the method of choice for the elemental analysis of non-homogeneous or irregularly shaped samples as well as small samples or even inclusions. The fields of application comprise analyses of jewelry, bulk materials and metallic coatings in routine and quality control (M1 MISTRAL, M2 BLIZZARD), and high speed “on the fly” measurements of virtually any kind of inorganic and organic sample (M4 TORNADO).

Applications

- Minerals
- Metals and alloys
- Electronic components (RoHS)
- Particles
- Forensics
- Coatings and metallic multilayer stacks
- Non-destructive element analysis in art conservation, archeology and archeometry

The ARTAX, the ELIO, the CRONO, and the M6 JETSTREAM are unique portable MXRF spectrometers for the non-destructive analysis of large, immobile and valuable objects on site, i.e. in archaeometry and restoration. They can be used for both spot measurements and high resolution 1D and 2D mapping. Several spot sizes are available for the CRONO and the M6 JETSTREAM.

The M6 JETSTREAM, the CRONO and the ELIO can operate in either horizontal or vertical positions.

Speed and Spatial Resolution

Using polycapillary optics, Bruker’s MXRF spectrometers can illuminate areas down to 20 µm in diameter with maximum X-ray intensity. The integrated Peltier-cooled XFlash® silicon drift detectors process highest count rates at optimal energy resolution.

Short measurement times and fast sample stages lead to extremely quick results regarding the elemental composition of a sample.

- Spatially resolved analysis of arbitrarily shaped samples, including fine structures
- No cooling media or consumables required
- Non-destructive measurement without sample preparation
- Outstanding analytical flexibility

Handheld-Mobile-Portable Elemental Spectrometry



S1 TITAN



TRACER 5i



EOS 500



CTX

Applications

- Analysis of metal alloys for Positive Material Identification (PMI)
- Non-destructive testing with grade ID and chemistry
- Light element capability: Mg, Al, Si, P
- Scrap metal recycling
- QA/QC in the manufacturing environment

Applications

- Art conservation, archaeology and archeometry
- Research and teaching tool for universities
- Research and development
- Selected by leading museums like the Getty and MOMA

Applications

- Scrap metal sorting for Al, Ti and Mg alloys
- Analysis of metal alloys for Positive Material Identification (PMI)
- Preferred for Li, Mg, Al, Si
- Fingerprint ID

Applications

- Oil and fuel inspections (MARPOL)
- Natural resource exploration (Geo Sciences)
- Food safety and quality
- Plant and soil health
- Materials science and research
- Border patrol stations
- Precious metals recycling

MXRF
HH-XRF
HH-LIBS

XRF Elemental Analyzer

- Light element analysis – Mg, Al, Si, P, S and Cl without vacuum or He
- SDD provides rapid analysis and ID of alloys
- TÜV SÜD certification – trusted the world over!
- Joint Bruker/NASA patent, earned NASA's Space Seal for vacuum technology
- Tube-based XRF for handheld elemental analysis – no radioactive materials

LIBS Elemental Analyzer

- No X-ray regulations
- Preferred for Li, Mg, Al, Si
- Fast Grade ID & Chemistry
- Flexible battery design
 - 1 battery operation for reduced weight
 - 2 battery operation for 12hr run-time
 - "Hot-swap" capability

Bruker's handheld elemental analyzers provide quick and easy non-destructive analysis. The S1 TITAN enables fast analysis and ID of most alloys. TRACER 5i systems include the Bruker/NASA joint patented vacuum system and high-resolution detector, allowing laboratory grade results of elements from Na to U. The EOS 500 gives fast (3-5 seconds) grade ID and chemistry of Al, Ti, and Mg alloys. The CTX, a portable, safety interlocked XRF analyzer, covers an elemental detection range from Mg to U.

Combustion Gas Analysis (CGA)

CGA Combustion Gas Analyzers – fast and accurate

Based on know-how collected over many decades, Bruker Elemental offers innovative solutions for rapid and precise elemental analysis.

The state-of-the-art technologies for fast and reliable determination of carbon, sulfur, oxygen, nitrogen and hydrogen with simple and user-friendly operation provide highly accurate results for process and quality control, as well as for materials research and development.

The clearly and simply structured Bruker “One-4-All” software interface for CGA analyzers, along with intuitive operation via an external PC with Windows® software, maximizes convenience and productivity.

Applications

- Iron, steel, cast iron
- Ferroalloys
- Aluminum and alloys
- Titanium, zirconium and alloys
- Ores, minerals
- Cement, lime, limestone, clays
- Coal, coke, fly ash
- Catalysts

CS Analysis

The G4 ICARUS HF combustion analyzer with high frequency induction furnace and infrared detection is the instrument of choice for rapid and precise, simultaneous analysis of carbon and sulfur down to ppm levels in a large variety of solid materials.

By introducing key technology advances, the G4 ICARUS HF creates a new dimension of usability and productivity.

The innovative combustion zone design combined with a unique, fully automatic cleaning system with brush- and vacuum-free dust removal leads to significantly reduced maintenance, thus maximizing productivity, applicability and component lifetime.



G4 ICARUS

CS Analysis

The G4 ICARUS HF analyzer is designed for simultaneous, fast and accurate determination of carbon and sulfur in a large variety of metallic and nonmetallic materials. G4 ICARUS features:

- Innovative design of the combustion zone with gas extraction nozzle (pat. pending) provides lance-free operation, reduced maintenance, higher productivity
- Fully automatic cleaning system with noiseless, brush- and vacuum-free dust removal into the used crucible
- Double dual range solid-state NDIR detector with two measuring ranges for CO₂ and SO₂ as standard
- Zero-flow mode saves oxygen during break periods, in stand-by mode additionally no reagent consumption

ONH Analysis

The high-end G8 GALILEO ONH analyzer is designed for rapid and automatic determination of oxygen, nitrogen and hydrogen in solid materials, based on the inert gas fusion (IGF) principle, which involves fusion of the sample material in a graphite crucible at high temperatures. When combined with an external, temperature-programmable infrared heated furnace, the G8 GALILEO can measure the diffusible hydrogen content in many sample materials, e.g. in welds according to ISO 3690 and AWS4 4.3, as well as in high strength steel.

The G4 PHOENIX DH carrier gas hot extraction analyzer is the right solution for accurate and rapid diffusible hydrogen measurement in a wide variety of matrices. The 30-mm quartz tube diameter of the temperature-programmable infrared furnace enables the analysis of large samples such as steel sheet strips and weld coupons according to AWS A4.3 and ISO 3690.

Coupling a mass spectrometer to the ONH analyzer leads to a substantially improved detection limit for the determination of ultra-low diffusible hydrogen concentrations e.g., in high strength steels by Thermal Desorption Mass Spectrometry (TDMS).



G8 GALILEO

Applications

- Iron, steel and alloys
- Copper and alloys
- Aluminum and alloys
- Titanium, zirconium and alloys
- Ores, minerals
- Ceramics, minerals
- Coal, coke, fly ash
- Catalysts

CS/ONH-Analysis



G4 PHOENIX with mass spectrometer

ONH-Analysis

The G8 GALILEO is available in different configurations for simultaneous or single element determination. Besides the analysis of total hydrogen by melt extraction it enables the analysis of diffusible hydrogen by hot extraction with the external tube furnace. G8 GALILEO features:

- Programmable temperature of the electrode furnace, contact-free optical sensor for temperature measurement and precise control
- High stability detection system with NDIR detector for CO and thermal conductivity cell for N₂ and H₂
- Optional automatic furnace cleaning with dust removal, automatic crucible changer and sample loader
- Optional quadrupole mass spectrometer enables the measurement of ultra-low diffusible hydrogen concentrations

Applications

- Steel
- Aluminum
- Weld material
- Welds acc. to ISO 3690/AWS A4.3

Optical Emission Spectrometry (OES)

High-End Elemental Analysis of Metals

Spark optical emission spectrometers (S-OES) are the ideal instruments for all types of metals. From pure metal trace analysis to high alloyed grades, spark OES covers the complete range from sub-ppm to percentage levels. All relevant elements can directly be analyzed simultaneously.

Spark spectrometer instruments cover all types of metal applications. Our range of high-end instruments allows you to elevate your business into new levels of quality and process control.

Applications

- Iron and steel alloys and traces
- Nitrogen in steel
- Cleanliness and inclusion determination in steel
- Zinc alloys and traces
- Aluminum alloys and traces
- Copper alloys and traces
- Oxygen in copper
- Nickel alloys and traces
- Cobalt alloys and traces
- Magnesium alloys and traces
- Tin alloys and traces
- Lead alloys and traces
- Titanium alloys and traces



Q8 MAGELLAN



Q4 TASMAN (CCD)

Applications Q4 TASMAN

- Iron, steel and alloys
- Aluminum and alloys
- Copper and alloys
- Nickel and alloys
- Cobalt and alloys
- Magnesium and alloys
- Lead and alloys
- Tin and alloys
- Titanium and alloys
- Zinc and alloys



Q4 MOBILE

Applications Q4 MOBILE

- Positive Material Identification (PMI) of metals
- Sorting of metals
- Analysis of metals including short-wavelength elements P, S, B, Sn



Q2 ION (CCD)

Applications Q2 ION

- Iron, steel and alloys
- Aluminum and alloys
- Copper and alloys
- Zinc and alloys

Complete Range of CCD- and PMT-based OES metal analyzers covering every requirement:

- Q2 ION: Ultra compact, portable OES with patented optical system
- Q4 MOBILE: True mobility, flexible probe choices and full UV-element capabilities with patented in-probe optic
- Q4 TASMAN: Three different models of advanced benchtop spectrometers cover every common analytical task

- Q8 MAGELLAN: High-end stationary PMT-based OES with Time Resolved Spectroscopy capabilities, trace and impurity analysis

Innovations like the future-safe ELEMENTAL.SUITE software, Spark Stands with co-axial Argon flow for better results and reduced TCO are shared by all Bruker OES analyzers.

Fluorescence Microscopy (FM)

Leading Advances in Bioimaging

Bruker's suite of fluorescence microscopy systems provides a full range of techniques and instrumentation solutions for life science researchers.

At the forefront of scientific discoveries for over a decade, **Ultima Multiphoton Microscope Systems** deliver a unique combination of flexibility, imaging depth, speed and resolution required for intravital imaging applications in neuroscience, oncology and immunology, from in vivo applications utilizing live animals to detailed investigation of tissue slices, tissue explants, and cell cultures.

Based on single-molecule localization techniques (PALM, STORM, etc.), **Vutara 352** is the world's first quantitative super-resolution microscope, providing an entirely new dimension of functionality to perform pair-correlation, co-location, cluster, and live-cell investigations.



Vutara 352
Super-Resolution
Microscope



Luxendo InVi SPIM
Lightsheet Microscope

Feature-Rich Life Sciences Software That's Easy to Use

Bruker's proprietary fluorescence microscopy software delivers the advanced capabilities and custom programming that cutting-edge bioresearch requires. The open, intuitive architecture, however, flattens the learning curve while allowing researchers to work seamlessly with a host of third-party programs.



Ultima Investigator
Multiphoton Imaging System

With its short acquisition times and cell-protecting minimization of photobleaching and phototoxicity, the **Opterra II Multipoint Scanning Confocal Microscope** enables cell biologists to study function and structure in cell cultures and invertebrate model organisms at previously unattainable speeds and durations.

Bruker's Luxendo light-sheet microscopes are revolutionizing long-term studies in developmental biology and the investigation of dynamic processes in cell culture and small animal models.

The **MuVi SPIM** enables long-term (up to several days) observation of developmental biology preparations, allowing fast 3D imaging of living objects without the need for sample rotation.

The **InVi SPIM** combines a proprietary optical configuration and fast acquisition to provide 3D reconstruction, tracking of cellular and subcellular positions, and morphological analysis of living specimens in real time.

OES

FM

Atomic Force Microscopy (AFM)



BioScope Resolve
BioAFM



Dimension FastScan AFM

The Highest Performance, Highest Resolution AFMs, Powered by PeakForce Tapping

Bruker's atomic force microscopes (AFMs) incorporate the very latest technique advances, including proprietary **PeakForce Tapping®** technology, to enable researchers to discover new possibilities in mechanical, electrical and chemical applications.

Groundbreaking systems include the **Dimension FastScan®**, which combines the highest resolution capabilities found in a large-sample AFM with unmatched bandwidth to enable a wider range of materials science applications than is possible with competing systems.

Specifically designed for integration onto inverted optical light and confocal microscopes, the **BioScope Resolve®** provides the highest resolution imaging, most complete biomechanics capabilities, and fastest scanning of any bioAFM available. It enables investigation of a wide range of biological samples, from cells and tissues to molecular and protein structures.

Bruker's new **NanoMechanics Lab™** delivers a full set of advanced modes to enable quantifiable nanoscale characterization extending from soft sticky hydrogels and composites to stiff metals and ceramics, allowing correlation to traceable measurements with nanoindentation.

The new **NanoElectrical Lab™** contains the most complete array of electrical AFM techniques to provide simultaneous capture of nanometer-scale electrical and mechanical characteristics in high-density data cubes, previously impossible to attain in a single measurement.

Bruker-Exclusive PeakForce Tapping Technology

As the most significant scientific breakthrough in AFM technology since the introduction of Tapping Mode, PeakForce Tapping is today's principal AFM mode with the fastest growing publication record. This groundbreaking mode enables researchers of all experience levels to precisely control probe-to-sample interaction, enabling the lowest available forces for the most consistent, highest resolution AFM imaging over the widest range of sample types, from the softest biological samples to very hard materials.

Stylus and Optical Metrology (SOM)

Over 40 Years of Surface Metrology Innovation

Bruker's industry-leading metrology systems offer fast, non-contact analyses for samples ranging in size from microscopic MEMS to entire engine blocks. Our 3D optical microscopes are the culmination of ten generations of proprietary Wyko® technology advances that provide the high sensitivity and stability necessary for precision surface measurements in applications and environments that are challenging for competing technologies.

Bruker's **Contour Elite® 3D Optical Microscopes** combine proven white light interferometric metrology, intuitive Vision64® analysis software, and exceptional new imaging capabilities. Contour Elite systems deliver the high-speed operation, accuracy, and repeatability that top-level R&D and production requires, and adds the imaging and display advantages commonly associated with confocal microscopy.

NPFLEX™ provides the most flexible, non-contact, 3D areal surface characterization for such large samples as orthopedic medical implants and the larger parts in aerospace, automotive and precision machining industries.

Dektak® Stylus Profilers have been the industry-standard solution for measuring thin film thickness, stress, and surface roughness in applications ranging from educational research verification to semiconductor process control. For over 40 years they have provided repeatable, accurate measurements on varied surfaces, from traditional 2D surface roughness characterization and step height measurements to advanced 3D mapping and film stress analyses.

Security of Bruker's Industry-Best Service and Support

Bruker's Technical Service Representatives are certified in installing, maintaining, and servicing a very large and varied base of installed systems. However, where our experts take the next step as a valuable partner is in their advanced applications knowledge for a wide variety of markets. With training and service centers around the globe, every Bruker customer is ensured of receiving timely and personalized user and system support.



Dektak XT
Stylus Profiler



Contour Elite 3D
Optical Microscopes



NPFLEX 3D
Optical Profiler

AFM

SOM

Tribology and Mechanical Testing (TMT)

Advanced Testing Under Real-World Conditions

Bruker's mechanical testing tools, tribometers, and nanomechanical test instruments enable new frontiers in materials characterization, materials development, and process monitoring across the widest range of markets, from heavy industry and semiconductor to automotive and biomedical.

Bruker's Universal Mechanical Tester (UMT) platform has been the most versatile and widely used tribometer on the market for nearly two decades. Now, **UMT TriboLab™** builds on that legacy, providing higher speeds, more torque, and better force measurement to perform practically every common tribological test.

TriboLab CMP delivers reliable, flexible, and cost-effective bench characterization of wafer polishing processes, offering on-board diagnostics and flexibility in sample type, size, and mounting for a better understanding of CMP applications.

Bruker's **Hysitron TI 980 TribolIndenter®** builds upon decades of Hysitron® technological innovation to deliver new levels of performance and capability in nanomechanical characterization, achieving remarkable advances in control and throughput, testing flexibility, measurement reliability, and system modularity.

Hysitron PI Series PicoIndenter are a comprehensive suite of nanomechanical and nanotribological test instruments that combine the advantages of advanced microscopy technologies with quantitative in-situ nanomechanical characterization to accelerate the understanding of material behavior at the nanoscale.



UMT TriboLab
Mechanical Tester



Hysitron PI 88
SEM PicoIndenter



Hysitron TI 980
TribolIndenter

Largest Range of Nanomechanical Testing Modes

- **nanoDMA Dynamic Nanoindentation** – continuous measurement of elastic-plastic and viscoelastic properties as a function of indentation depth, frequency, and time
- **XPM Accelerated Property Mapping** – nanomechanical testing throughput paired with measurement resolution and accuracy
- **SPM+ Imaging** – the same probe rasters the sample surface for topography imaging and conducts the nanomechanical test
- **Nanoindentation** – precise lateral positioning and nanoscale load and depth control for quantitative determination of localized mechanical properties
- **Nanoscratch** – ultra-sensitive force and displacement measurements in normal and lateral directions for quantitative nanoscale tribological characterization on individual microstructures
- **Nanowear** – nanometer-to-micrometer wear behavior quantified as a function of the number of sliding cycles, sliding velocity, wear area, and applied force

Unique Range of Electron Microscope Analyzers

Bruker's Energy-Dispersive Spectrometry (EDS), Wavelength-Dispersive Spectrometry (WDS), Electron Backscatter Diffractometry (EBSD), and Micro-X-ray Fluorescence Spectrometry (MXRF) analysers for electron microscopes offer the most comprehensive compositional and structural analysis of materials available today. They cover the majority of applications and tackle even your toughest challenges with unprecedented speed, accuracy and ease of use.

The full integration of all these techniques into Bruker's ESPRIT 2 software allows you to easily combine data obtained by these complementary methods for best results. For Transmission Kikuchi Diffraction analysis (TKD) in SEM, the EBSD system can be configured with the OPTIMUS™ TKD detector head that was specifically designed for best sample-detector geometry.

The innovative SDDs designed especially for TEM (XFlash® 6T I30 and 6T I60) offer minimum mechanical and electromagnetic interference, provide optimum take-off angle, and avoid the necessity of sample tilt.



XFlash® 6 I 10 for EDS



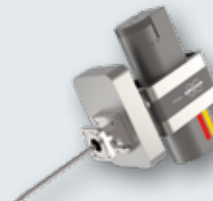
XSense for WDS



eFlash for EBSD and TKD, with Toolkit and sample holder

Applications

- Metals and alloys
- Semiconductors
- Layers and coatings
- Thin films
- Minerals
- Glasses
- Nanomaterials
- Plastics and organic solids
- Biological samples
- Forensics



XTrace for MXRF on SEM



QUANTAX for Nano-Analysis

- Worldwide leading technologies for SEM and TEM
- EDS systems with XFlash® 6 detectors with active areas from 10 to 100 mm² provide highest energy resolution, maximum throughput and optimum geometry
- XSense – Ultra-sensitive parallel beam WD spectrometer for X-ray microanalysis in the low energy range
- High-end EBSD/TKD system with technologically leading eFlash detectors, OPTIMUS™ TKD detector head, and TKD Professional Toolkit for fast simultaneous EBSD/EDS and TKD/EDS analysis
- XTrace – high performance micro-spot X-ray source for MXRF analysis in SEM

TMT

EM Analyzers

Single Crystal X-Ray Diffraction (SC-XRD)



D8 QUEST with sealed tube source and PHOTON III CPAD detector

Crystallography: Driving Modern Science

Detailed insight into the relationship between structure, function, and reactivity is crucial for the success of modern science. Crystallography is one of the most powerful, unambiguous methods for generating this vital information. It provides accurate and precise measurements of molecular dimensions from small molecules and macromolecules in a way that no other science can begin to approach and remains the method of choice for studying chemical structures in atomic detail.

To get the maximum benefit out of this technique, scientists need the latest analytical tools. This is the driving vision of our development: to provide your cutting-edge research with the superior tools it deserves.

The D8 QUEST and D8 VENTURE can be perfectly configured for the demands of any imaginable application in SC-XRD.

Applications

- Structure determination in chemistry, pharmacology and mineralogy
- Absolute structure determination on molybdenum and copper radiation
- Metal-organic frameworks, crystalline sponges and coordination chemistry
- Electron density studies by high-angle and short wavelength diffraction
- Structural investigation of high pressure phases
- Integrated treatment of up to eight-fold twinned samples
- Phase transitions
- Modulated structures
- Diffuse scattering
- Powder (e.g. in capillary)



I μ S 3.0 for Cu, Mo and Ag radiation



Dual source configuration with I μ S 3.0 for Mo and Cu radiation

Riding the Perfect Wave

Matching the right wavelength to your sample can significantly improve the quality of the experiment. Molybdenum radiation is most often the wavelength of choice for chemical crystallography.

Bruker offers a wide range of X-ray sources for tailoring a system to your needs:

- Sealed tube spot focus for Cu and Mo radiation (flat graphite or TRIUMPH monochromator)
- I μ S microfocus sources for Cu, Mo or Ag radiation
- TURBO X-RAY SOURCE microfocus rotating anode for Cu and Mo radiation
- METALJET, liquid-metal jet source for Ga and In radiation

When Details Matter – Biological Crystallography

Continued technological advances in macromolecular crystallography have enabled structural biologists to tackle projects of ever-greater ambition. At the same time, modern structural genomics and drug discovery initiatives are striving for ever-greater productivity and efficiency. This is placing significantly greater demands on researchers and instrumentation. The second-generation D8 VENTURE again features new technologies that will further help the researcher to address the most challenging samples.

Brighten up your home lab – METALJET, TXS, I μ S and I μ S DIAMOND, all with HELIOS MX

High flux, small beam size and stability are essential for collecting quality data from challenging crystals. These requirements have driven developments in synchrotron design, and Bruker applies these important lessons to home-lab source technology. Our sources now deliver X-ray intensities comparable to those of typical bending-magnet beamlines. The modern METALJET now crosses the next boundary matching diffraction limits previously only seen at third generation synchrotrons.



D8 VENTURE with METALJET source
and PHOTON III detector

Applications

- Substrate binding
- Membrane proteins
- Molecular replacement
- Protein microcrystals
- Multi-protein complexes
- High-resolution protein structures
- SAD-phasing
- Molecular motors
- Twinned protein samples
- Protein-DNA complexes
- GPCR structure determination
- Structural enzymology
- *In-situ* screening
- LCP samples

**Chemical
and Biological
Crystallography**

CPAD—From 4th Generation XFEL to Your Home Laboratory

As every photon diffracted from a sample provides a quantum of information that describes the sample's structure, an ideal X-ray detector must faithfully record each and every photon in order to preserve this precious information. Our new PHOTON III Charge-Integrating Pixel Array Detector (CPAD) detector comes very close to this ideal, with speed, sensitivity, and accuracy superior to any other detector available in the home laboratory.

- Largest active area of any pixel array detector (280 × 100 mm² or 140 × 100 mm²)
- No gaps, based on one or two large monolithic wafer-scale silicon sensors
- Photon-counting and integration mode (mixed mode) for largest dynamic range
- No charge sharing effects, zero counting losses
- High uniformity, highest sensitivity, best data quality

High-Throughput Tools for X-Ray Crystallography



SCOUT

The SCOUT automated cryo-cooled crystal-handling system features a ceiling-mounted robot for sample handling and state-of-the-art cryogenic technology. The SCOUT mounts and retrieves samples quickly and reliably. It is fully compatible with modern synchrotron standards.



ISX STAGE

The ISX STAGE is an automated plate-stage fully compatible with our KAPPA goniometer. The methods development associated with room temperature *in-situ* crystallography over recent years have been mirrored in the popularity of the ISX STAGE.



AGH

The AGH allows samples to be aligned automatically with X-rays. This advanced capability, which until now has been available only at top synchrotron beamlines, allows even the smallest samples to be automatically aligned to perfection.

Bruker provides a number of new tools to increase productivity in both macromolecular and chemical crystallography. With automated in-house crystal screening, scoring, data collection and processing, our automated high-throughput solutions lead to higher success in academia and industry.



IµS DIAMOND Microfocus Source Breathtaking performance without maintenance

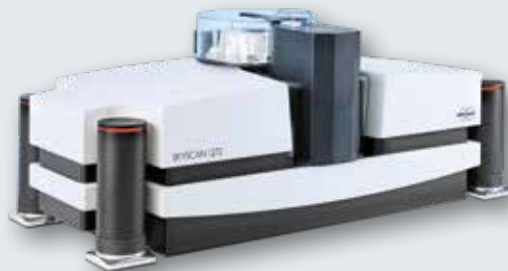
The new IµS DIAMOND X-ray source, the first microfocus source to exploit the extreme heat conductivity of diamond to produce a compact X-ray source with an intensity superior to typical rotating anodes. But, unlike rotating anodes the IµS DIAMOND features several years of continuous operation without any routine maintenance. The technology is so reliable that Bruker offers a unique 99% uptime guarantee for this novel source.

X-Ray Micro Computed Tomography (μ CT)

X-ray micro-computed tomography (μ CT) is one of the most advanced methods for getting 3D insights into samples of any material, any shape, and any size with little to no sample preparation.

Bruker microCT, a pioneer of μ CT, has now made this technology easier and more accessible for everyone by offering unparalleled 3D X-ray microscopy.

A single scan is all you need to reveal the complete internal 3D structure of your sample non-destructively.



SKYSCAN 1272 – Ultra-versatile high-resolution μ CT



SKYSCAN 1275 - Fully automated high-speed μ CT



SKYSCAN 1173 – High-energy μ CT



SKYSCAN 1174 – Most compact μ CT

Non-destructive 3D Imaging with X-rays

Micro computed tomography (μ CT) is X-ray imaging in 3D, by the same method used in hospital CT scans, but on a small scale with massively increased resolution. It really represents 3D microscopy, where very fine scale internal structure of objects is imaged non-destructively.

Chem./Biol.
Crystallography

μ CT

ECO Systems for XRD, XRF and SC-XRD

Designed for the ecological and economical needs of today

The **D8 ADVANCE ECO** and **D8 ENDEAVOR ECO** extend the D8 diffractometer family to 1 kW and a minimum ecological footprint. Its high-brilliance line focus X-ray source has very low energy consumption, does not require external water cooling, and has no special needs concerning lab infrastructure. The D8 ADVANCE ECO is fully compatible with the D8 diffractometer family, guaranteeing flexibility for the future. The system can be easily upgraded at any time for new applications, allowing you to take maximum advantage of your investment.

The **S8 TIGER 1 kW** offers wavelength dispersive X-ray fluorescence (WDXRF) performance at a unique low cost of ownership. Based on Bruker's established "Plug 'n Analyze" technology, the S8 TIGER 1 kW operates with little power and without any need for cooling water or compressed air. With S8 TIGER 1 kW

configurations, Bruker addresses the demand for economical instruments for process and quality control in cement plants, the petrochemical industry and for industrial minerals.

The **D8 QUEST ECO** is designed to provide the maximum performance cost balance, and features the PHOTON II CMOS detector with a sensor that is two times larger compared to traditional CCDs, and allows data collection in shutterless mode. This ensures excellent data quality and unprecedented data acquisition speed. The D8 QUEST ECO has an automation plugin, a great tool for both expert crystallographers and users that are less familiar with single crystal diffraction systems. If experimental requirements change in the future, the D8 QUEST ECO can be upgraded with a number of high performance source and detector options, including the I μ S 3.0 microfocus source and the PHOTON III detector, our technology flagship.



D8 ADVANCE ECO



D8 ENDEAVOR ECO



S8 TIGER 1 kW



D8 QUEST ECO

ECO Line

The ECO Line features an innovative design enabling low cost of ownership, and minimized consumption of resources, all while providing superior analytical performance: ECOlogical, ECOperformance, ECOnomical. At the same time, all instruments within the ECO Line provide uncompromised ease-of-use combined with outstanding analytical results. Unparalleled instrument uptime is assured with superior instrument quality – backed up by unrivaled component guarantees.

Lab and Process Automation

Bruker X-ray instruments are designed with high flexibility for future requirements. They can be upgraded to automatic operation. All Bruker X-ray solutions allow seamless and flexible integration into laboratory and total automation solutions.



D8 FABLINE



S2 PUMA



S8 TIGER



D8 ENDEAVOR



S8 LION

Automation Solution using D8 and S8

- Sample transportation
- Sample preparation
- Sample handling robotics
- Automation software
- Seamless integration into laboratories
- Total automation solutions e.g. for the cement, aluminum and semiconductor industry
- Container laboratories
- Flexible integration packages
- Upgrade packages
- Powerful Automation Control Software AXSLAB
- Interfacing to plant control system or LIMS (Laboratory Information Management System)

Automation Control Software AXSLAB

Laboratory automation is controlled by Bruker's powerful AXSLAB software. From any PC in the network, single jobs or batches can be started and the status can be easily checked. Intelligent sample management allows the highest sample throughput and immediate access to priority samples.

The Whole Spectrum with SPECTRA^{plus}

The fully IAI Integrated Analytical Intelligence in SPECTRA^{plus} is based on more than 50 years of experience in XRF analysis – for standardless XRF analysis for all types of materials. Corrections can be made automatically.

Contact Us for More Information

For more detailed information on specific Bruker products and systems, please complete and send this form to your nearest Bruker office.

- | | | |
|--|---|--|
| <input type="checkbox"/> ARTAX (MXRF) | <input type="checkbox"/> Hysitron BioSoft (TMT) | <input type="checkbox"/> QUANTAX (EDS/WDS/EBSD/MXRF-SEM) |
| <input type="checkbox"/> BioScope Resolve (AFM) | <input type="checkbox"/> Hysitron IntraSpect 360 (TMT) | <input type="checkbox"/> Q2 ION (OES) |
| <input type="checkbox"/> Contour Elite (SOM) | <input type="checkbox"/> Hysitron PI Series (TMT) | <input type="checkbox"/> Q4 MOBILE (OES) |
| <input type="checkbox"/> ContourSP (SOM) | <input type="checkbox"/> Hysitron TI 980 (TMT) | <input type="checkbox"/> Q4 TASMAN (OES) |
| <input type="checkbox"/> CRONO (MXRF) | <input type="checkbox"/> Hysitron TI Premier (TMT) | <input type="checkbox"/> Q8 MAGELLAN (OES) |
| <input type="checkbox"/> CTX (HH-XRF) | <input type="checkbox"/> Hysitron TriboScope (TMT) | <input type="checkbox"/> Q8 CORONADO (OES) |
| <input type="checkbox"/> D2 PHASER (XRD) | <input type="checkbox"/> NANOSTAR (SAXS) | <input type="checkbox"/> S1 TITAN (HH-XRF) |
| <input type="checkbox"/> D8 ENDEAVOR (XRD) | <input type="checkbox"/> N8 HORIZON (SAXS/WAXS/GI-SAXS) | <input type="checkbox"/> S2 PUMA (XRF) |
| <input type="checkbox"/> D8 ADVANCE (XRD) | <input type="checkbox"/> G4 ICARUS HF (CGA) | <input type="checkbox"/> S2 KODIAK (XRF) |
| <input type="checkbox"/> D8 ADVANCE ECO (XRD) | <input type="checkbox"/> G4 PHOENIX DH (CGA) | <input type="checkbox"/> S2 PICOFOX (TXRF) |
| <input type="checkbox"/> D8 DISCOVER (XRD) | <input type="checkbox"/> G8 GALILEO ONH (CGA) | <input type="checkbox"/> S4 T-STAR (TXRF) |
| <input type="checkbox"/> D8 DISCOVER (XRD ²) | <input type="checkbox"/> Innova (AFM) | <input type="checkbox"/> S8 TIGER (XRF) |
| <input type="checkbox"/> D8 QUEST (SC-XRD) | <input type="checkbox"/> Innova-IRIS (AFM) | <input type="checkbox"/> S8 LION (XRF) |
| <input type="checkbox"/> D8 QUEST ECO (SC-XRD) | <input type="checkbox"/> Luxendo InVI SPIM (FM) | <input type="checkbox"/> SKYSCAN 1272 (μCT) |
| <input type="checkbox"/> D8 VENTURE (SC-XRD) | <input type="checkbox"/> Luxendo MuVI SPIM (FM) | <input type="checkbox"/> SKYSCAN 1275 (μCT) |
| <input type="checkbox"/> Dektak XT (SOM) | <input type="checkbox"/> M1 MISTRAL (MXRF) | <input type="checkbox"/> TRACER Series (HH-XRF) |
| <input type="checkbox"/> Dektak XTL (SOM) | <input type="checkbox"/> M2 BLIZZARD (MXRF) | <input type="checkbox"/> TriboLab CMP (TMT) |
| <input type="checkbox"/> Dimension Edge (AFM) | <input type="checkbox"/> M4 TORNADO (MXRF) | <input type="checkbox"/> Ultima IntraVital (FM) |
| <input type="checkbox"/> Dimension FastScan (AFM) | <input type="checkbox"/> M6 JETSTREAM (MXRF) | <input type="checkbox"/> Ultima Investigator (FM) |
| <input type="checkbox"/> Dimension Icon (AFM) | <input type="checkbox"/> MultiMode 8-HR (AFM) | <input type="checkbox"/> Ultima In Vitro (FM) |
| <input type="checkbox"/> ELIO (MXRF) | <input type="checkbox"/> NPFLEX (SOM) | <input type="checkbox"/> UMT TriboLab (TMT) |
| <input type="checkbox"/> EOS 500 (HH-LIBS) | <input type="checkbox"/> Opterra II (FM) | <input type="checkbox"/> Vutara 352 (FM) |
| <input type="checkbox"/> FastScan Bio (AFM) | | |

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