OLYMPUS®

Your Vision, Our Future

XRD-XRF Instrument

BTX Profiler

Combined XRD and XRF
for Comprehensive Materials Analysis

NEW

- Mineralogy-Phase Analysis with 2-D-XRD
- Elemental Analysis with ED-XRF
- Seamless Integration of Data and Results
- Economy of Operational Cost, Space and Time

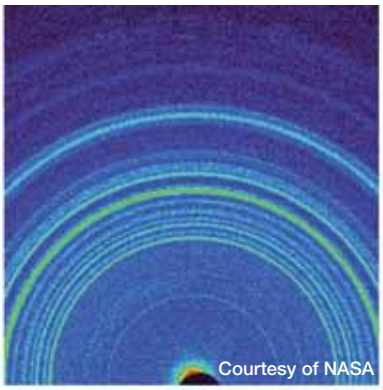
The BTX Profiler XRD and XRF Instrument

For Full Compositional Analysis

The BTX Profiler carries on the revolutionary XRD technology employed in NASA's "Curiosity" Rover, part of the successful NASA Mars Science Laboratory program. It combines with the highly acclaimed, award winning Earth-bound technology employed in Olympus Analytical XRD and XRF Instruments.

Building on NASA and Olympus patents, the BTX Profiler is a leap forward in the technology of combined XRD and XRF analysis. The BTX Profiler provides comprehensive compositional materials analysis at both the structural and elemental level. The BTX Profiler, with its combined XRD and XRF technologies, affords economy of operational costs, space, and time with a seamless integration of data and results.

NASA and OLYMPUS Technologies


Courtesy of NASA


Courtesy of NASA

For Comprehensive High Throughput Materials Analysis

The BTX Profiler provides combined 2-D-XRD and ED-XRF analysis for full compositional analysis. This nondestructive, high-performance capability is of particular significance for several industrial sectors including energy, geochemistry, pharmaceuticals, catalysts, forensics and education.

- Energy Exploration
- Green Field Mining and Geo-steering
- Mud-logging
- Mineral Identification
- Ore Grade Control
- Benefication Efficiency
- Counterfeit Drug Screening
- Pharmaceutical Discovery Library Building
- Catalyst Development
- Fire and Explosives Forensics
- Corrosion Monitoring
- Education and Research

Combined X-ray Diffraction and X-ray Fluorescence

The BTX Profiler provides state of the art performance for both XRD structural (mineralogy/phase) and XRF elemental analysis. This is achieved by approaching each analysis with its own optimized technology, affording the high performance required for excellence in comprehensive compositional materials analysis.

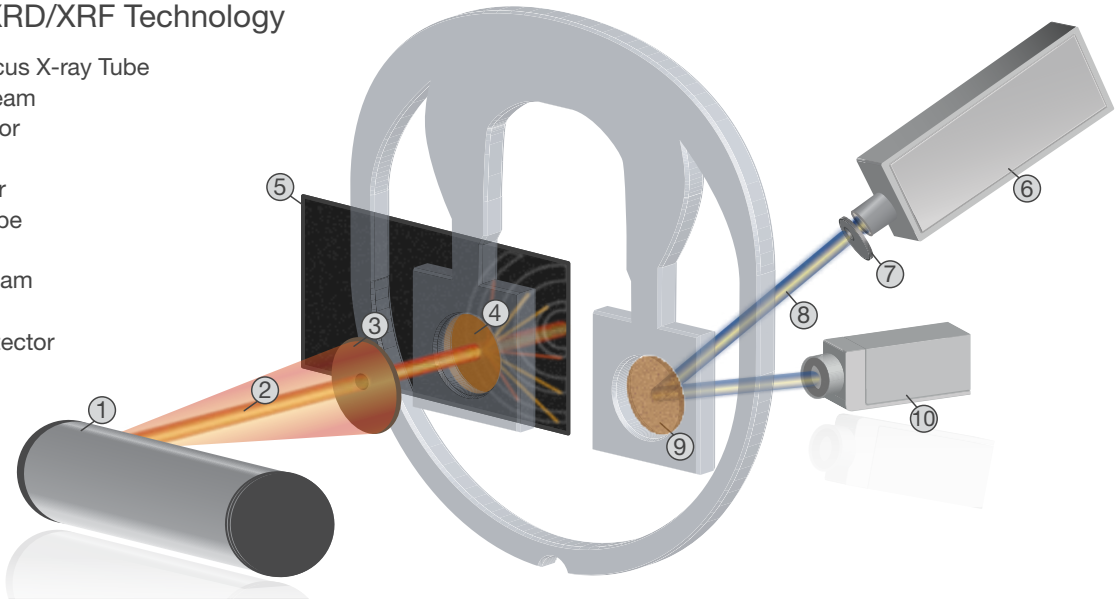
The two dimensional transmission (2-D) XRD analysis technology utilizes a microfocus X-ray source coupled with a high resolution Charge Coupled Device (CCD) detector.

This technology is based on the award winning and patented designs found on the Mars Science Laboratory "Curiosity".

The energy dispersive (ED) XRF analysis technology utilizes selectable, optimized beam paths of a miniature X-ray tube and specialized filters with an advanced, large area Silicon Drift Detector (SDD). This technology is based on the award winning and patented designs found in the Olympus Analytical XRF Instruments.

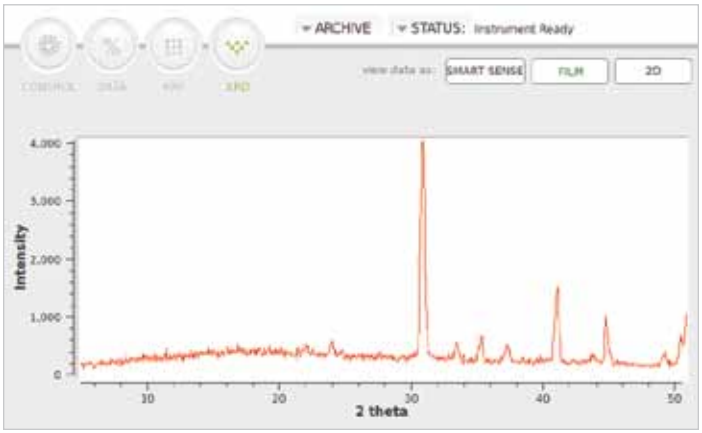
Combined XRD/XRF Technology

1. XRD Microfocus X-ray Tube
2. XRD X-ray Beam
3. XRD Collimator
4. XRD Sample
5. CCD Detector
6. XRF X-ray Tube
7. Filter Wheel
8. XRF X-ray Beam
9. XRF Sample
10. XRF SDD Detector



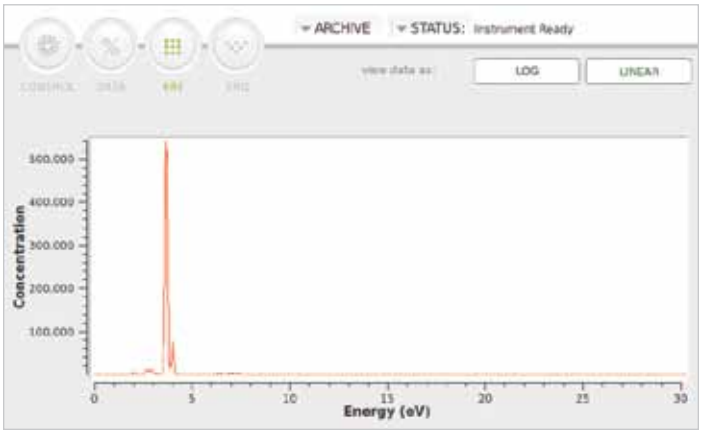
XRD for Compound Analysis

2-D Transmission X-ray Diffraction is a structural analysis technique that utilizes an X-ray source to excite material at the atomic level and a detector that captures an image of the scattering of X-rays (diffraction pattern) caused by interaction with the material's crystalline substance (phase). The locations and intensities of the scattering identify the substance, much like a fingerprint. Intensity ratios or whole pattern analyses are used to determine the phase (compound) concentration.



XRF for Elemental Analysis

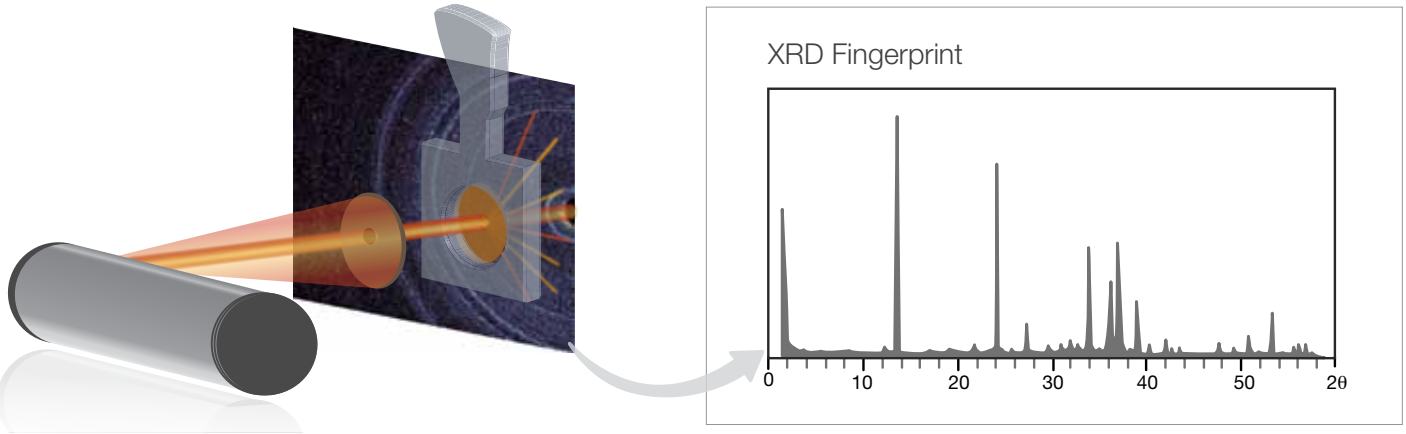
Energy Dispersive X-ray Fluorescence is an elemental analysis technique that utilizes an X-ray source to excite material at the atomic level with enough energy to expel inner orbital electrons and a detector that measures the signature energies released when an element's outer orbital electrons change orbital levels to regain stability. An element is identified by its signature energy (keV) signals and the intensities of the signals are used to determine the elemental concentration.



X-ray Diffraction Analysis

The 2-D X-ray diffraction technology in the BTX Profiler is revolutionary. It enhances the XRD experience and reduces inefficiencies found in conventional powder diffraction systems. The close-coupled transmission geometry allows for a low powered X-ray source and a small amount of sample. The sophisticated sample handling technology incorporates a patented vibration system that enables random crystal orientation in a fixed sample cell.

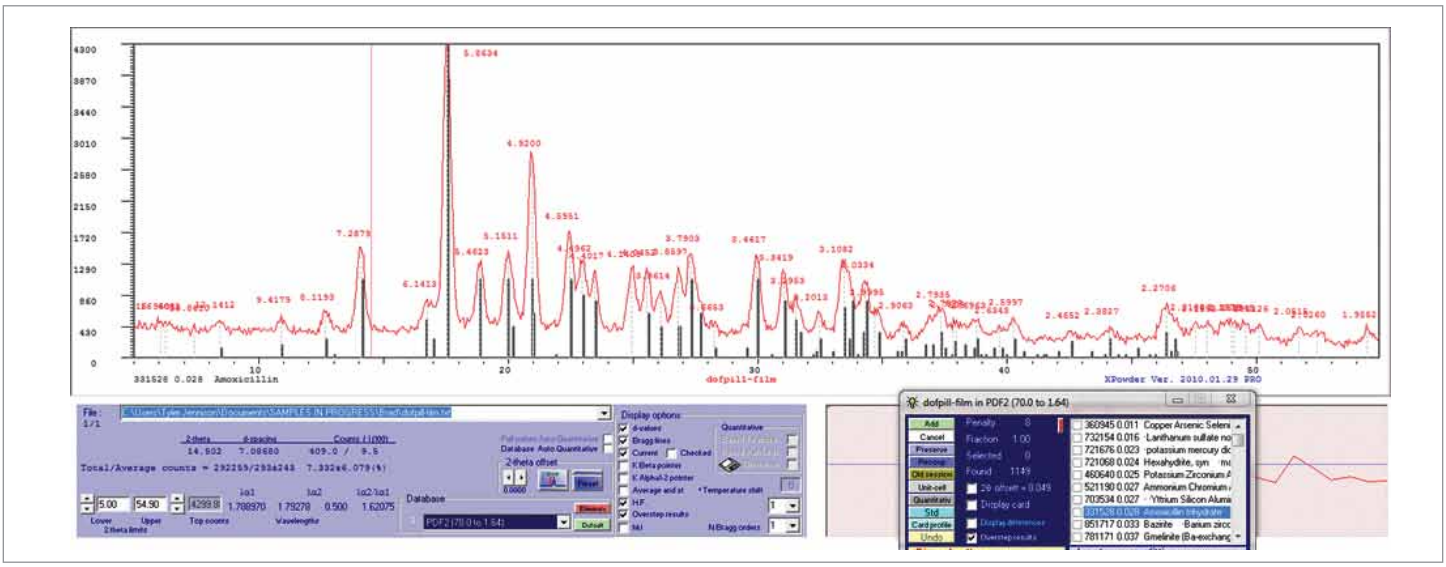
The CCD detector with its “smart” energy discrimination provides graphical 2-D diffraction patterns, or Ring Patterns, and acquires more data more quickly than conventional XRD detectors. The combination of these features reduces operational costs, space, and time of measurement while providing a high peak-to-background ratio for rapid, accurate, and precise XRD data analysis.



XRD Pattern Analysis

The X-ray source excites material at the atomic level and the CCD detector captures a 2-D image of the diffraction pattern caused by interaction with the material’s crystalline substance (phase). This image is referred to as a Debye or Diffraction Ring where each ring corresponds to a diffraction pattern peak and the brightness of a ring corresponds to the intensity.

The CCD Detector enables whole or large portions of the diffraction rings to be measured simultaneously. Data processing software then converts the 2-D image to a plot of intensity vs. energy. It further converts the energy to a 2-θ value for a plot comparable to conventional diffractometer data. The XRD pattern identifies a compound much like a fingerprint does.

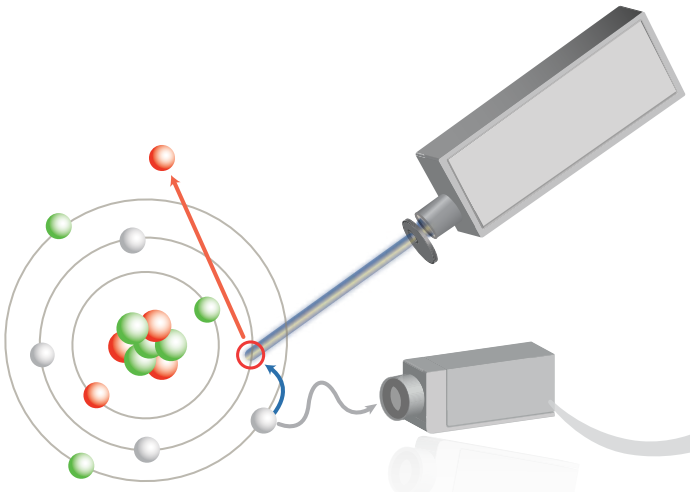


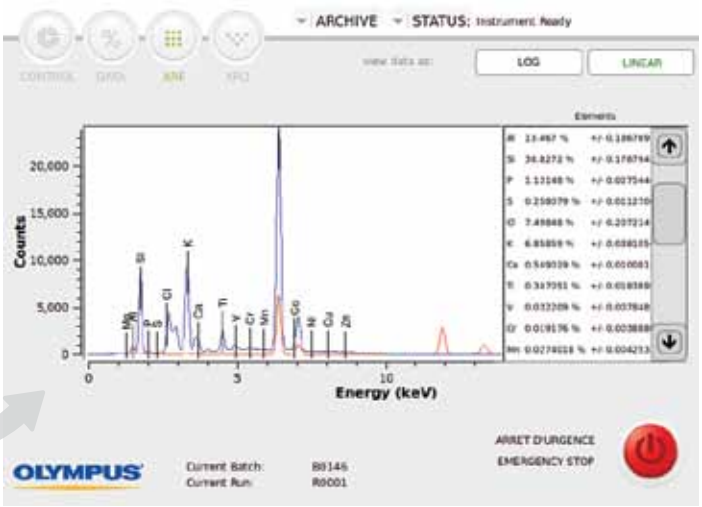
XPowder, the XRD Processing software, includes the AMSCD mineral database as well as the ability to use the ICDD Powder Diffraction Files. For quantitative analysis, XPowder comes complete with reference intensity ratio (RIR) methods as well as full-pattern analysis tools. Furthermore, XRD pattern data is provided in a variety of file formats, making XRD pattern interpretation in third-party programs easily accessible.

X-ray Fluorescence Analysis

The ED X-ray Fluorescence technology in the BTX Profiler is adapted from the highly acclaimed portable XRF analyzers from Olympus. Selectable optimized beam paths of the miniature X-ray tube and specialized filters, along with close coupled geometry with the sample and detector, allow for a wide elemental and concentration measurement range.

The large area silicon drift detector (SDD) provides optimized resolution and detection limits. The combination of these features reduces operational costs, space, and time of measurement while providing rapid, accurate, and precise XRF data analysis.





XRF Spectral Analysis

The miniature X-ray tube excites material at the atomic level with enough energy to expel inner orbital electrons of an element while the detector measures the signature energies released when the element's outer orbital electrons change orbital levels to regain stability.

The energies (keV) detected identify which elements are present in a material. The intensities (Counts/s) of the energies correlate to the elemental concentrations in the material.

The BTX Profiler can analyze elements highlighted in blue; elements highlighted in orange can also be analyzed, but require use of Helium purge for low concentration level analysis. The degree of detection and quantification will depend on sample density and thickness.

The XRF Data Processing Software provides qualitative, semi-quantitative, and quantitative information including spectral viewing and elemental peak identification. It incorporates factory calibrations based on Fundamental Parameters (FP) models. These FP calibrations can be empirically optimized using a series of user-specific certified standards. The offline "Method Builder" software package allows a user to optimize their calibration curves, customize their analytical programs and download to the analyzer.

The software provides additional capabilities for analysis including viewing elemental regions, selectable peak identification, concentration results, and spectral overlay of sample sets.

BTX Benchtop X-ray Configurations

The BTX Benchtop X-ray Analyzer from Olympus is available in three configurations. The BTX Profiler, with full XRD mineralogical and full XRF elemental analysis capabilities, is available for single sample measurement or for unattended multi-sample measurements with an integrated autosampler. The BTX-II has the full XRD mineralogical analysis capabilities of the BTX Profiler, but only rudimentary XRF information gleaned from the CCD detector; it essentially aids in the XRD mineralogical identification and analysis as opposed to providing the full, rigorous elemental ED-XRF analysis found in the BTX Profiler.

BTX Profiler for Multiple Samples

The BTX Profiler with an integrated autosampler has full XRD and XRF analysis capabilities with unattended measurement of up to twenty samples. It is ideal for situations that require longer analysis time or the collection of analytical data without the presence of an operator.

The base unit is provided with four sample trays; additional sample trays are optional. This configuration of the BTX Profiler can be provided with an optional Helium purge mechanism allowing for optimum analysis of light elements.

BTX Profiler for Single Samples

The BTX Profiler for single sample measurements has full XRD and XRF analysis capabilities; one sample at a time is loaded into the chamber.

The base unit is provided with one sample tray; additional sample trays are optional. This configuration of the BTX Profiler can be provided with an optional Helium purge mechanism allowing for optimum analysis of light elements.

BTX II for Single Samples

The BTX II for single sample measurements has full XRD analysis capabilities; one sample at a time is loaded into the chamber. The XRF technology for the BTX II is rudimentary; it aids the XRD analysis, but does not provide full XRF elemental analysis. User interface is through PC operation.

The base unit is provided with one sample holder; additional sample holders are optional.

Portable XRD and XRF Analyzer Configurations

For those who demand benchtop analytical power with the ease of portability, Olympus offers field-rugged, closed-beam, battery operated portable X-ray analyzers for on-site analysis in virtually any environment. These unique, nondestructive, minimal sample requirement analyzers allow for fast, in-field analysis. The Terra XRD and the X-5000 XRF can be used as primary analyzers, lab backup analyzers, screening tools, or field inspection systems.

Terra Portable XRD

The Terra Portable XRD for single sample measurements in the field has full XRD analysis capabilities; one sample is loaded into the chamber at a time. The XRF technology for the Terra is rudimentary; it aids the XRD analysis, but does not provide full XRF elemental analysis. User interface is through PC operation.

X-5000 Portable XRF

The X-5000 Portable XRF for single sample measurements in the field has full XRF elemental analysis capabilities; one sample at a time is loaded into the chamber. There is no XRD technology in the X-5000. User interface is through a fully integrated onboard PC.

BTX Profiler with Integrated Autosampler

BTX Profiler Specifications*

	BTX Profiler for Single Sample Analysis	BTX Profiler for Multi-Sample Analysis
XRD SPECFICATIONS		
XRD range	5-55 degrees 2θ	5-55 degrees 2θ
XRD resolution	0.25 degrees 2θ	0.25 degrees 2θ
XRD detector type	1024 × 256 pixels 2-D Peltier cooled CCD	1024 × 256 pixels 2-D Peltier cooled CCD
Sample grain size	<150 µm crushed powder (100 mesh screen)	<150 µm crushed powder (100 mesh screen)
Other sample types	Gels, greases	Gels, greases
Sample quantity	~0.5 grams	~0.5 grams
X-ray target material	Copper (cobalt optional)	Copper (cobalt optional)
X-ray tube voltage	30 kV	30 kV
Max X-ray tube current	330 µA	330 µA
XRF SPECFICATIONS		
XRF detector	Large-Area Silicon Drift Detector	Large-Area Silicon Drift Detector
X-ray target material	Rh	Rh
X-ray tube geometry	Transmission target end window	Transmission target end window
X-ray tube voltage	40 kV	40 kV
Max X-ray tube current	200 µA	200 µA
Light element analysis	Helium flush ~ 0.25 l/min	Helium flush ~ 0.25 l/min
Primary filter	7 position programmable	7 position programmable
Sample quantity	~2 grams	~2 grams
Operating temperature	-10 °C to 35 °C (14 °F to 95 °F)	-10 °C to 35 °C (14 °F to 95 °F)
Weight	23.13 Kg (51 lb) / single sample unit	32.66 Kg (72 lb) / 20 position autosample unit
Dimensions	49.3 cm × 39.7 cm × 34.4 cm / single sample unit (19.41 in. × 15.66 in. × 13.55 in.) / single sample unit	67.4 cm × 39.7 cm × 34.4 cm / 20 position autosample unit (26.57 in. × 15.66 in. × 13.55 in.) / 20 position autosample unit

OLYMPUS NDT INC. is ISO 9001 and 14001 certified

*All specifications are subject to change without notice.

www.olympus-ims.com

OLYMPUS NDT INC.
48 Woerd Avenue, Waltham, MA 02453, USA, Tel.: (1) 781-419-3900
12569 Gulf Freeway, Houston, TX 77034, USA, Tel.: (1) 281-922-9300

For inquiries - contact
www.olympus-ims.com/contact-us

FSC Mixed Sources
Product group from well-managed forests, controlled sources and recycled wood or fiber
Cert no.
www.fsc.org
© 1996 Forest Stewardship Council

BTX_Profiler_Brochure_201306_revB • Printed in the USA • P/N: 920-274-EN Rev. B