NEX CG

Elemental analysis by X-ray fluorescence

High-performance EDXRF elemental analyzer

Rigaku

Applied Rigaku Technologies, Inc.

Simple elemental analysis

1. Prepare samples
No digestion; minimal sample preparation. Direct non-destructive measurement of most materials.

2. Load samples
Autosampler for unattended operation. EZ Analysis software interface for simple operation.

3. Start analysis
Fast simultaneous multi-element quantitative results. Powerful RPF-SQX software minimizes standards.

Rigaku NEX CG technology couples monochromatic secondary target excitation with a Cartesian geometry optical kernel

Energy dispersive X-ray fluorescence (EDXRF) is a routinely used analytical technique for the qualitative and quantitative determination of major and minor atomic elements in a wide variety of sample types. This measurement technique offers an unparalleled level of versatility that is derived from its ability to provide rapid, non-destructive, multi-element analyses — from low parts-per-million (ppm) levels to high weight percent (wt%) concentrations — for elements from sodium ($_{11}$Na) to uranium ($_{92}$U).

As a multi-purpose, high-performance EDXRF spectrometer, the Rigaku NEX CG delivers routine elemental measurements across a diverse range of matrices — from homogeneous, low viscosity liquids to solids, metals, slurries, powders and pastes. Especially well-suited to the semi-quantitative determination of elemental content in complete unknowns, the superior analytical power, flexibility and ease-of-use of the Rigaku NEX CG add to its broad appeal for applications ranging from research & development to industrial and in-plant quality assurance.
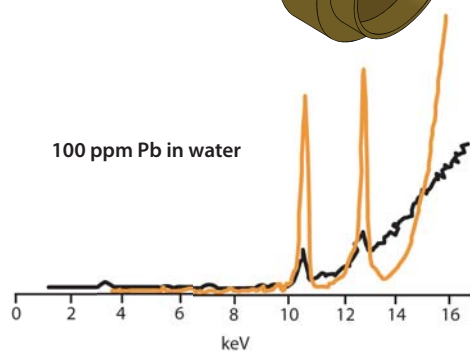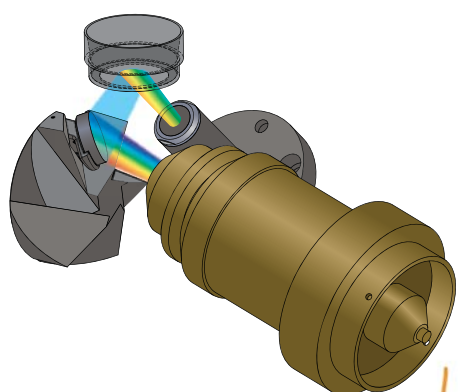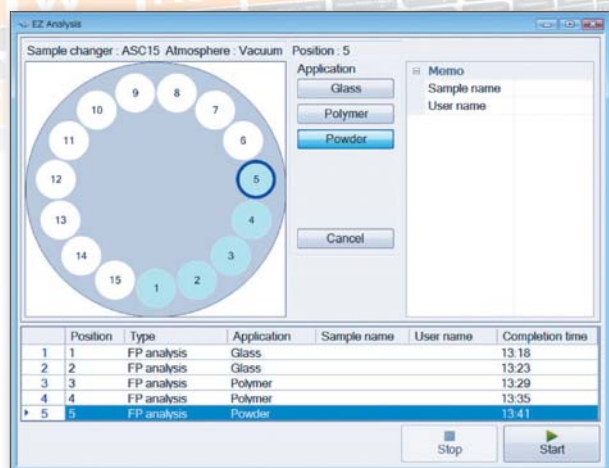
Key features and benefits

- **Analyze from sodium ($_{11}$Na) through uranium ($_{92}$U)**
- **Non-destructive elemental analysis**
- **Quantify solids, slurries, liquids, powders and coatings**
- **Polarized excitation delivers lower detection limits**
- **High resolution silicon drift detector (SDD)**
- **Analysis in air, helium or vacuum**
- **RPF-SQX for semi-quantitative analysis without standards**
- **Semi-empirical calibrations require very few standards**
- **Advanced novel treatment of peak overlap reduces errors**
- **EZ Analysis interface for routine operation**
- **Standard 15-position automatic sampler (shown below)**

EZ Analysis interface for simple routine operation

Rigaku NEX CG software was developed to be both extraordinarily powerful and extremely easy to use. Ideal for non-technical operators, routine analyses are performed through a simplified customizable EZ Analysis interface. Software operation simply involves selecting the sample position on the computer screen and entering a sample name. Next, the application method (i.e., calibration) is selected. Selecting the "start" button with the mouse pointer initiates the analysis. The depth and breadth of features, as well as the sophistication of the interface, is the result of decades of XRF software development at Rigaku.


3D geometry for highest peak-to-background

Unlike conventional EDXRF analyzers, the NEX CG was engineered with a unique close-coupled Cartesian Geometry (CG) optical kernel that dramatically increases signal-to-noise. Monochromatic or polarized excitation from secondary targets, instead of conventional "noisy" white radiation (Bremsstrahlung) direct excitation, vastly improves detection limits for elements in highly scattering matrices like water, hydrocarbons, and biological materials.

The resulting dramatic reduction in background noise, and simultaneous increase in element peaks, affords a spectrometer capable of routine trace element analysis even in difficult sample types. Up to five secondary targets cover the complete elemental range (Na – U) with optimized sensitivity.

Excitation is provided by a close-coupled 50 watt Pd-anode end-window X-ray tube. For maximum stability, the tube is fitted with a shutter so that the tube may remain on at all times for maximum stability and durability. An available uninterruptible power supply (UPS) compensates for power line fluctuations and extends tube life. Superior counting statistics and designed-in high stability translate into extraordinary analytical performance.

100 ppm Pb in water

Mo secondary target delivers exceptional signal-to-noise (orange spectrum) as compared to conventional excitation (black spectrum)
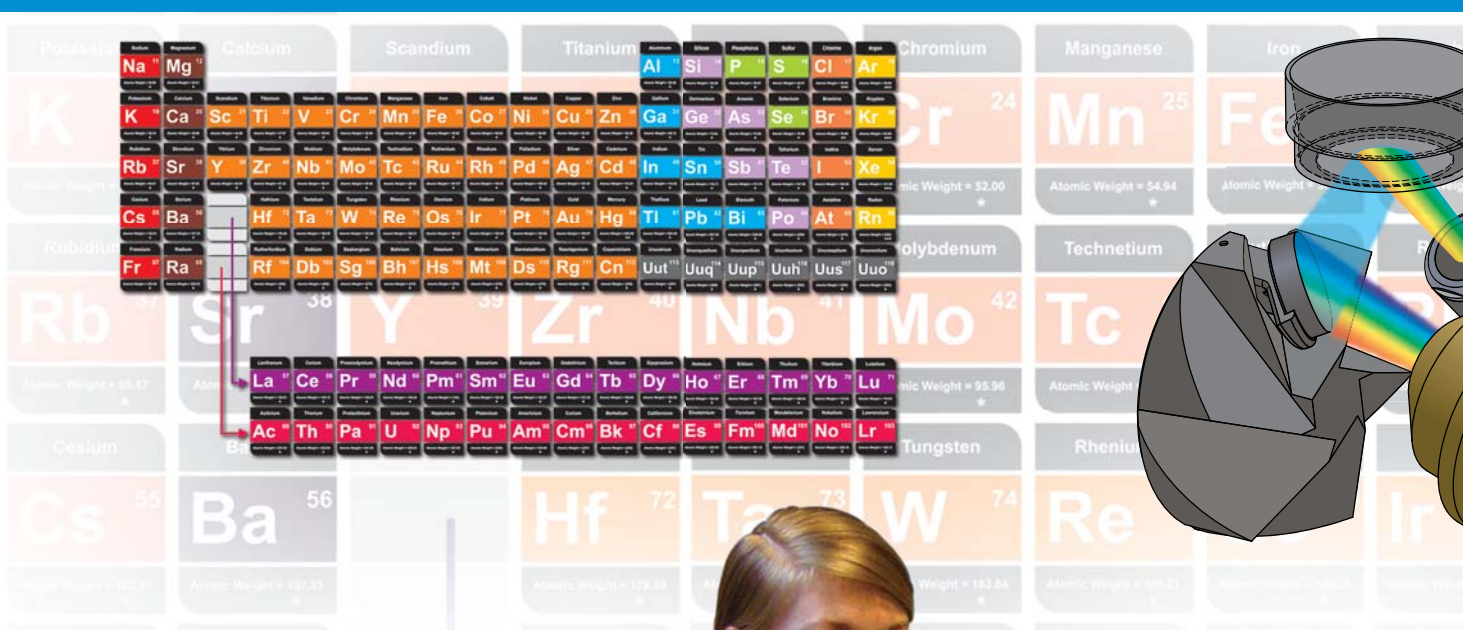
Silicon drift detector for exceptional precision

A silicon drift detector (SDD) affords extremely high count rate capability with excellent spectral resolution. Superior counting statistics, realized in a low background noise environment from the 3D optical geometry and secondary target excitation, enables the Rigaku NEX CG to deliver the highest precision analytical results in the shortest possible measurement times.
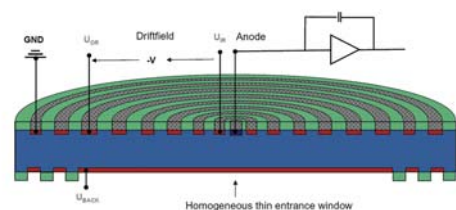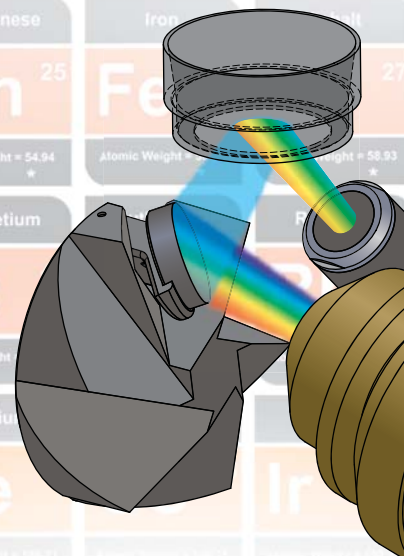

Simplified diagram of an SDD illustrating the concentric ring construction that allows for very high X-ray count rates

3D Cartesian X-ray optics for highest sensitivity

Advanced FP software

RPF-SQX, featuring Rigaku Profile Fitting technology, allows semi-quantitative analysis of almost all sample types without standards — and rigorous quantitative analysis with standards.

High-performance silicon drift detector (SDD)

Delivers superior peak shape and resolution while supplying high throughput for superior counting statistics.

15-position autosampler

Accepts standard 32 mm diameter cups for automated sample handling.

Monochromatic / polarized monochromatic excitation

Superior peak-to-background is achieved as compared to conventional Bremsstrahlung (white radiation) excitation — for lower detection limits.

Windows® based software

QuantEZ software was developed to be both extraordinarily powerful and extremely easy to use. The depth and breadth of features, as well as the sophistication of the interface, are the result of decades of XRF software development at Rigaku.
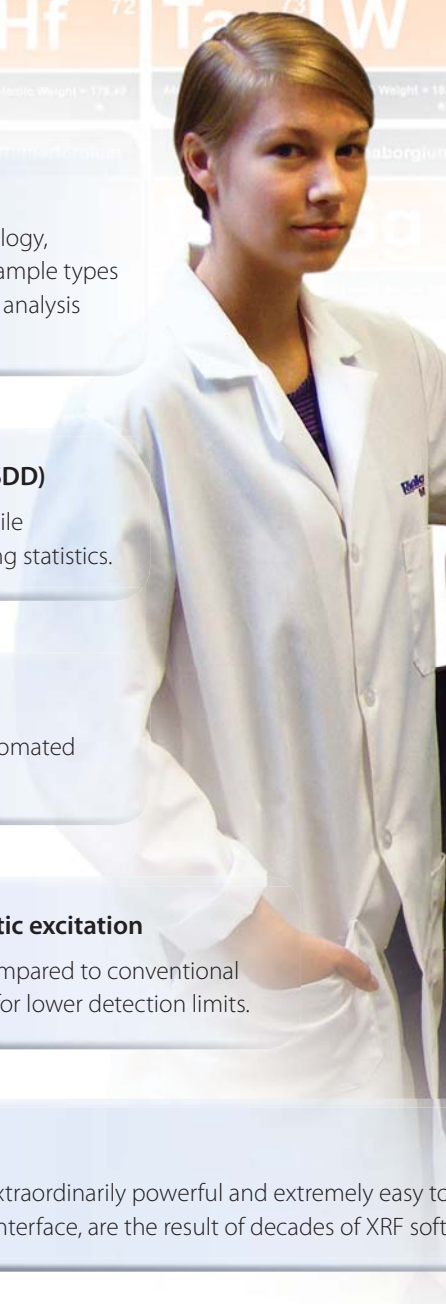
3D optics

The polychromatic X-rays from the tube irradiate a secondary target placed along the first axis. After scattering 90°, monochromatic X-rays travel along the second axis to the sample. Spectra from the sample are recorded by a detector on the third axis.

50 kV, 50 W X-ray tube

Close-coupled Pd-anode end-window X-ray tube is shuttered for maximum flux stability.

Light element optimization (LEO)

LEO secondary target delivers enhanced sensitivity for sodium ($_{11}$Na) and magnesium ($_{12}$Mg).

Sample spinner with autosampler

Available 9-position autosampler spins samples for superior results with inhomogeneous samples.

Available analysis atmospheres

Air, helium purge for enhanced light element sensitivity, or optional vacuum, delivering superior light element sensitivity for non-volatile samples.

Vacuum system

Available vacuum system comes with high capacity pump and vacuum sensor for short pump-down times.

Large sample chamber

Accommodates large samples, up to 38 cm diameter and 10 cm tall, as well as a variety of autosampler options.

Advanced fundamental parameter software

RPF-SQX reduces the need for standards

NEX CG is powered by new qualitative and quantitative analytical software, RPF-SQX, that features Rigaku Profile Fitting (RPF) technology. The software allows semi-quantitative analysis of almost all sample types without standards — and rigorous quantitative analysis with standards. Featuring Rigaku's famous Scatter FP method, the software can automatically estimate the concentration of unobserved low atomic number elements (H to F) and provide appropriate corrections.

Black dot: Raw data
Gray: Result of fitting
Purple: Barium
Green: Titanium
Red: Chromium

For RoHS polymer standard BCR680, coexisting elements Ti and Ba overlap with Cr; RPF-SQX deconvolutes the overlap so that Cr can be analyzed

RPF-SQX greatly reduces the number of required standards, for a given level of calibration fit, as compared to conventional EDXRF analytical software. As standards are expensive, and can be difficult to obtain for many applications, the utility of RPF-SQX can significantly lower the cost of ownership and reduce workload requirements for routine operation.

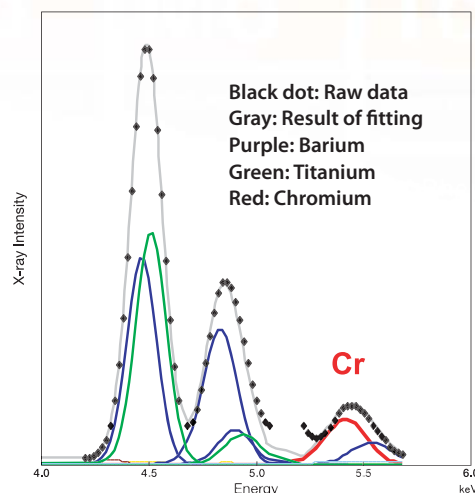## Versatility, flexibility and sensitivity

Along with the ability to measure relatively large samples, a number of important options are available, including a vacuum system and sample spinner. With the patented Rigaku UltraCarry®, you can use the Rigaku NEX CG to quantify trace elements in aqueous liquids down to parts-per-billion (ppb) concentration levels.
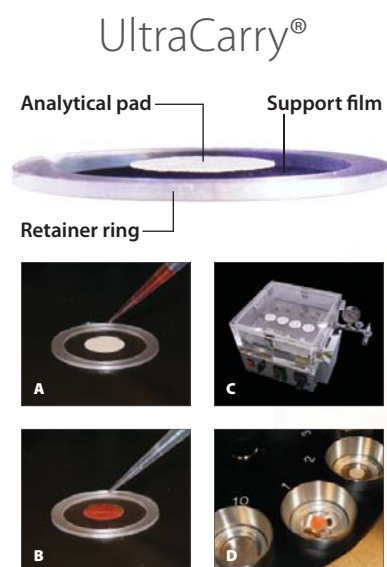
Large sample chamber (38 cm diameter and 10 cm tall) accommodates up to A4 size large samples for direct analysis

Optional sample spinner and 9-position changer allows analysis of non-uniform samples

UltraCarry®

Analytical pad — Support film — Retainer ring

Unlike ICP or AA instrumentation, anyone can quickly learn to use Ultra-Carry to perform routine trace element analysis, of aqueous solutions, down to ppb levels. No acids, no plumbing, no filtering, no gases, no digestion and nothing to clean.

1. Pipette – aqueous solution onto UltraCarry (A and B)
2. Dry – multiple samples simultaneously with UltraDry (C)
3. Analyze – with Rigaku NEX CG (D)

Iron · Cobalt · Nickel · Copper · Zinc · Gallium · Germanium

Fe 26 · Co 27 · Ni 28 · Cu 29 · Zn 30 · Ga 31 · G

Atomic Weight = 55.85 · Atomic Weight = 58.93 * · Atomic Weight = 58.69 * · Atomic Weight = 63.55 * · Atomic Weight = 65.38 * · Atomic Weight = 69.72 * · Atomic W

Ruthenium · Rhodium · Palladium · Silver · Cadmium · Indium

Specifications

Excitation

X-ray tube, end-window type with Pd anode
50 W max power
50 kV max voltage
Five standard polarization and secondary targets for optimum excitation

Detection

High-performance silicon drift detector (SDD)
Peltier electronic cooling
Digital pulse processor
Automated or user configurable shaping times for optimum analytical performance

Sample chamber

Large 38 cm diameter x 10 cm deep sample chamber allows for various sample sizes
15-position automatic sample changer (32 mm samples)
Analysis in air or helium atmosphere

Environmental conditions

Ambient temperature 18 – 28°C (65 – 82°F)
Relative humidity ≤75%
Vibration undetectable by human
Free from corrosive gas, dust and particles

Computer

External PC computer system
Microsoft® Windows® operating system
Keyboard and mouse
LCD monitor

Software

| |
|---|
| Menu-based software for control of spectrometer functions and data analysis |
| Application templates |
| Simple flow bar wizard to create your own methods |
| RPF-SQX FP for qualitative and quantitative analysis |
| Matching Library for augmentation of FP |
| Automatic spectral overlap deconvolution |
| Empirical calibration with overlap and matrix compensation |

Backed by Rigaku

Since its inception in 1951, Rigaku has been at the forefront of analytical and industrial instrumentation technology. Today, with hundreds of major innovations to our credit, the Rigaku Group of Companies are world leaders in the field of analytical X-ray instrumentation. Rigaku employs over 1,400 people worldwide in operations based in Japan, the U.S., Europe, South America and China.

Options

10-position automatic sample changer (35 – 40 mm samples)
9-position automatic sample changer with sample spinner (32 mm samples)
9-position automatic sample changer (32 – 50 mm samples)
Vacuum system
Uninterruptible power supply (UPS)
UltraCarry® for trace analysis of aqueous solutions
Printer (US only)

Spectrometer data

Single phase AC	100/220 V, 15/7 A (50/60 Hz)
Dimensions:	60 (W) x 60 (D) x 40 (H) cm (23.6 x 23.6 x 15.7 in)
Weight:	80 kg (176 lbs.)
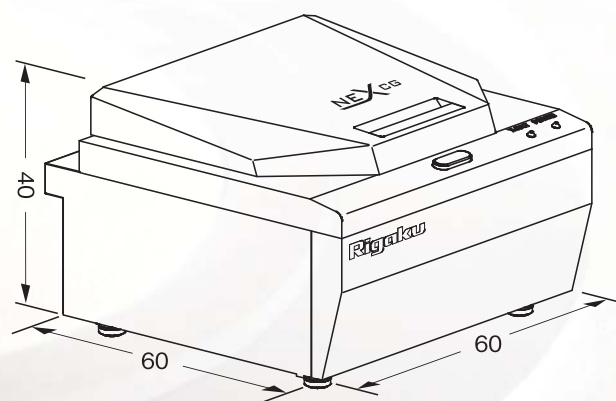
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