



NEX CG II



- **Model**
NEX CG II
- **X-ray tube**
50 W Pd-anode
- **Excitation**
Indirect with polarization EDXRF
- **Detector**
Large-area SDD
- **Autosampler**
32 mm
- **Required**
Teflon® covers
- **Sample type**
Ultra Carry disks 32 mm
- **Analysis time**
300 sec per analysis
condition, variable
- **Atmosphere**
Vacuum

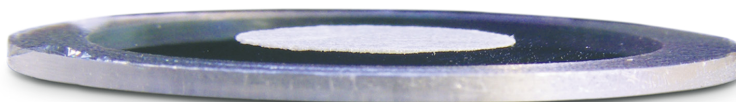
SCOPE

Typical detection limits for analyzing aqueous samples using Ultra Carry are demonstrated using the NEX CG II EDXRF analyzer.

BACKGROUND

Rigaku Ultra Carry is a novel sample retainer disk used to preconcentrate an aqueous liquid sample onto a uniform sample carrier optimized to suppress background noise. This approach dramatically improves sensitivity, resulting in up to two orders of magnitude improvement in lower limit of detection (LLD) and thus lower limit of quantification (LLQ) over measuring liquid samples neat.

Trace element analysis of aqueous-based solutions is important in many areas, such as industrial manufacturing effluents, quality control (QC) and quality assurance (QA) processes, environmental monitoring and remediation, agriculture, and general research. To meet the challenges of trace analysis into the ppb range, Rigaku offers the NEX CG II EDXRF analyzer and the Ultra Carry sample preparation disk. With the Rigaku system, trace analysis can be carried out by non-technical operators and experts without special scientific training and costly, complicated, time-consuming sample preparation.



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Teflon is a registered trademark of E.I. du Pont de Nemours and Company and its affiliates.

SAMPLE PREPARATION

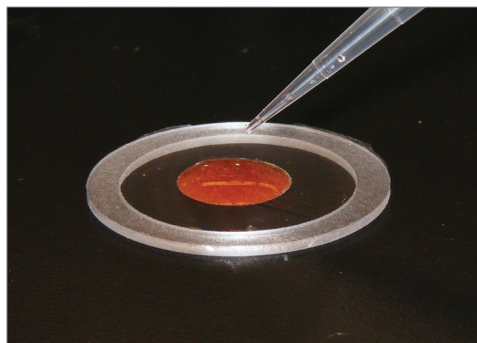
Ultra Carry is a novel disposable (single use) sample carrier used to preconcentrate aqueous samples into a uniform thin film optimized for the suppression of background noise. Relative to conventional bulk liquid sample presentation, this results in up to two orders of magnitude improvement in the lower limit of detection (LLD) for both heavy and light elements.

The design is comprised of a ring-shaped support fitted with an X-ray transmissive film and a patented central analytical pad. This design allows the liquid sample to dry in an even single layer, eliminating or minimizing the formation of concentric rings of dry sample material, giving a more consistent and repeatable XRF measurement.

Using the automatic sample changer, up to 15 samples can be measured in a single batch without operator intervention. The Ultra Carry technique is amazingly simple, requiring only three easy steps. It is an ideal tool for non-technical operators to routinely perform trace element analysis without a wet lab.

200 µL of aqueous liquid sample is pipetted onto the center of the Ultra Carry pad. Samples are then dried using the UltraDry vacuum hotplate or dried in a lab oven set at 70°C. Once dry, the Ultra Carry disks are simply placed in the autosampler tray with the pad side down and measured directly. Teflon® covers are placed over the samples to block stray X-rays from the chamber. Note that oils or non-polar liquids that do not dry cannot be used with Ultra Carry. Aqueous samples that form excessive salt crystals may not dry properly and may give inaccurate results.

1. Spot Ultra Carry



2. Dry the samples



3. Analyze



Disk in position



Batch analysis with Teflon® covers in place

DETECTION LIMIT

The following tables show typical detection limits based on the Ultra Carry template using Fundamental Parameters. A blank Ultra Carry disk spotted with DI water is measured to determine detection limits. Actual LLDs may differ slightly depending on the elements present in the aqueous liquid solution.

Element	LLD (ppm)	Element	LLD (ppm)
Na	1.70	Pd	0.20
Mg	0.27	Ag	0.25
Al	0.03	Cd	0.18
Si	0.06	In	0.17
P	0.01	Sn	0.14
S	0.01	Sb	0.15
Cl	0.02	Te	0.16
K	0.09	I	0.10
Ca	0.07	Cs	0.08
Ti	0.04	Ba	0.08
V	0.02	Hf	0.33
Cr	0.02	Ta	0.15
Mn	0.07	W	0.11
Fe	0.07	Re	0.14
Co	0.06	Ir	0.17
Ni	0.10	Pt	0.11
Cu	0.08	Au	0.07
Zn	0.05	Hg	0.07
Ga	0.06	Tl	0.07
Ge	0.03	Pb	0.09
As	0.04	Bi	0.07
Se	0.03	La	0.07
Br	0.03	Ce	0.06
Rb	0.04	Pr	0.05
Sr	0.06	Nd	0.05
Y	0.08	Sm	0.05
Nb	0.01	Eu	0.18
Mo	0.02	Gd	0.16
Ru	0.05	Th	0.09
Rh	1.57	U	0.10

LLDs shown are typical and may differ depending on measurement time used and the overall elemental composition of the sample being tested.

Na-Y measured by K-lines.

Nb-U measured by L-lines.

CONCLUSION

The Rigaku NEX CG II combines secondary and polarization target excitation with a high-performance wide-area SDD to deliver optimal EDXRF sensitivity. In conjunction with Ultra Carry, the NEX CG II is an ideal tool for the trace elemental analysis of aqueous solutions down to parts-per-billion levels. This technique is suitable for many applications, including:

INDUSTRIAL

- Monitor effluents, waste streams, and discharge waters
- Screen for common metals
- Measure hazardous elements
- QC of production rinse waters

ENVIRONMENTAL

- Pavement run-off
- Stormwater run-off
- Agricultural run-off
- Site remediation
- Soil leachate