



Mass Spectrometry

Break through the noise

Neoma™ MS/MS Multicollector ICP-MS

thermo scientific

Break through the noise

Complex science doesn't mean complicated analyses. The Thermo Scientific[™] Neoma[™] MS/MS MC-ICP-MS filters out the noise to give you world-class isotope ratio data with stunning clarity.



The challenge

Certain isobaric interferences (e.g. ^{87}Rb and ^{87}Sr) cannot be resolved.



The solution

Neoma MS/MS MC-ICP-MS allows isobaric interferences to be separated out through reaction, allowing you to break through the noise and analyze what you want.



There are some situations when even the highest resolution is not enough. For certain isotope systems (e.g. Rb-Sr) there are isobaric interferences that are not possible to resolve with classical high resolution ICP-MS technology. Neoma MS/MS MC-ICP-MS provides the solution.

The unique MS/MS technology within Neoma MS/MS MC-ICP-MS allows you to separate out isobaric interferences through reaction with gases within a **dedicated collision/reaction cell**.

Neoma MS/MS MC-ICP-MS provides extraordinary versatility allowing the largest number of isotopic systems to be analyzed thanks to the **unique pre-cell mass filter technology**. By removing matrix elements prior to reaction, the Neoma MS/MS MC-ICP-MS opens avenues in the field of laser ablation MC-ICP-MS and beyond.

Neoma MS/MS MC-ICP-MS

Technology that
transforms your
science

XHR (optional)

- eXtra High Resolution
- Resolve hydride interferences

Electrostatic analyzer (ESA)

Reproducible resolution switching

Hexapole collision/reaction cell

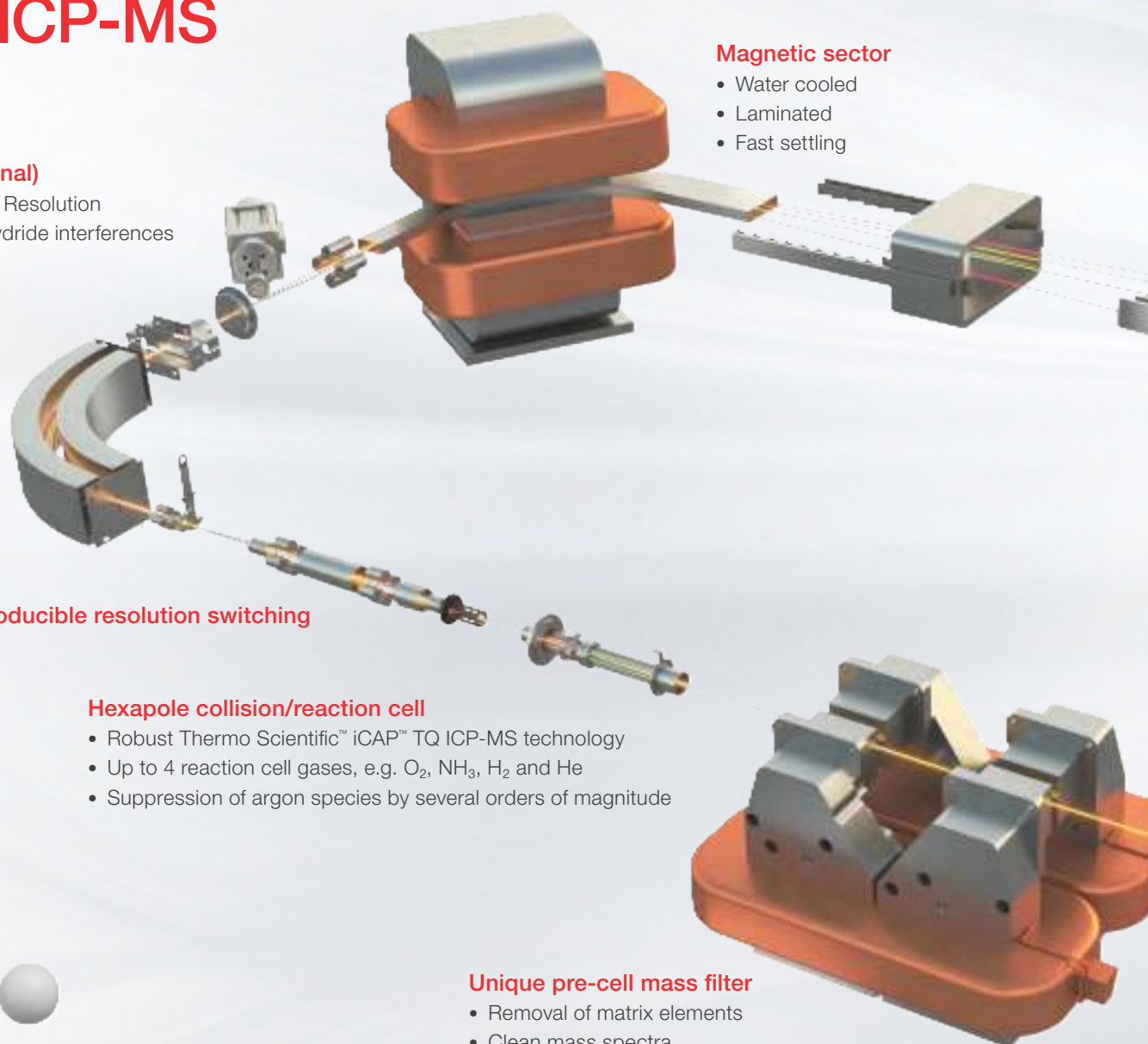
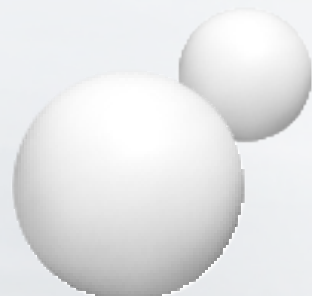
- Robust Thermo Scientific™ iCAP™ TQ ICP-MS technology
- Up to 4 reaction cell gases, e.g. O₂, NH₃, H₂ and He
- Suppression of argon species by several orders of magnitude

Unique pre-cell mass filter

- Removal of matrix elements
- Clean mass spectra
- No compromise in sensitivity
- Exponential mass bias

Magnetic sector

- Water cooled
- Laminated
- Fast settling



Enhanced dispersion

- For dynamic measurements
- Triple application multi-ion-counting (Os-Pb-U)



Extended detection system

- 10 moveable Faraday cups
- 1 central dual-mode detector (Faraday/SEM)
- No cup factors
- Precise automated positioning
- Highly reliable mechanism
- Maximum flexibility

RPQ (optional)

- Ultra-low abundance sensitivity

SEM

- High linearity
- High stability
- Long lifetime

Ion current amplifiers

- Up to 24 amplifier slots
- 6 Gcps dynamic range
- Freedom of amplifier selection
- Thermo Scientific™ 10^{13} Ω Amplifier Technology™
- Dual gain calibration
- High temperature stability



Inlet system

- Wet or dry plasma
- Laser ablation
- Hydride generation
- Gas chromatography

ICP and jet interface

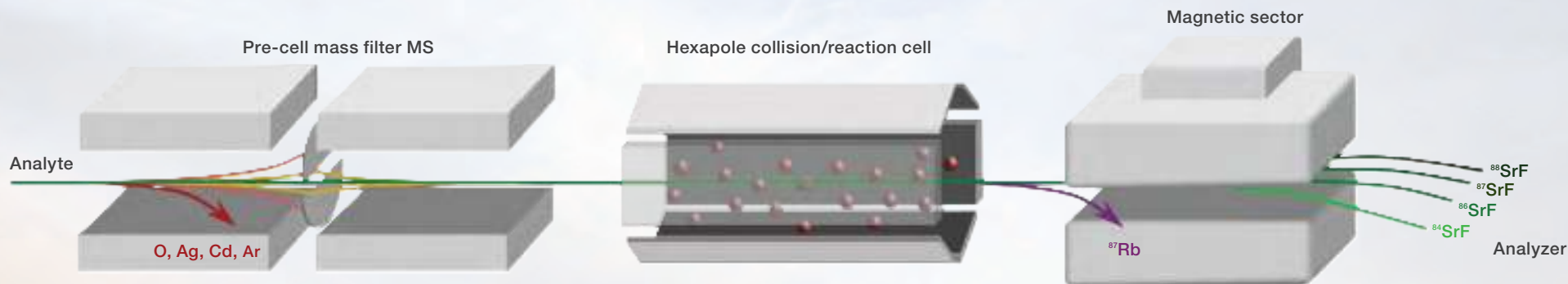
- Thermo Scientific™ iCAP™ Qnova Series ICP-MS
- Field-proven Ar ion source
- Ultimate ICP sensitivity and stability
- Ground potential interface
- High-performance interface pump



Inside MS/MS technology

For scientists familiar with triple quadrupole ICP-MS/MS technology, the Neoma MS/MS MC-ICP-MS represents a revolution in terms of precision and accuracy. Using the same principle of filter, react and separate pioneered with triple quadrupole ICP-MS/MS, the Neoma MS/MS MC-ICP-MS allows for effective removal of isobaric interferences with the additional benefit of simultaneous isotope analysis, allowing for ultimate precision and accuracy of your isotope ratio.





1. Filter

Clean mass spectra and non-isobaric interference removal

The pre-cell mass filter allows effective removal of the sample matrix, preventing the creation of molecular interferences inside the collision/reaction cell and cleaning up the mass spectra so that your analyte can be detected interference-free.

Utilizing magnetic sector technology, the pre-cell mass filter allows you to achieve the same sensitivity as the Neoma MC-ICP-MS and produces predictable exponential mass bias for accurate internal normalization.

A variable slit allows the mass range of interest to be easily selected and extracted on to the collision/reaction cell.

2. React

Highly effective interference removal

The hexapole collision/reaction cell can be pressurized with reactive gases to selectively generate reaction products thereby effectively removing isobaric interferences.

Up to four different collision and reaction gases can be connected.

3. Separate

Robust isotope separation and detection

The water cooled, laminated magnet of Neoma MS/MS MC-ICP-MS separates out the isotopes of interest. With a fast settling time, peak jumping between multiple isotope systems maximizes sample usage.

The enhanced variable multicollector detector array with 11 Faraday cup detectors maximizes sample usage and enables ultimate precision through the simultaneous measurement of all isotopes of interest, allowing simultaneous measurement of Rb and SrF in one line. The moveable collector array ensures the flexibility to cover isotopic applications from Li through to U, in low or high resolution, without compromising the native dispersion of the mass analyzer.



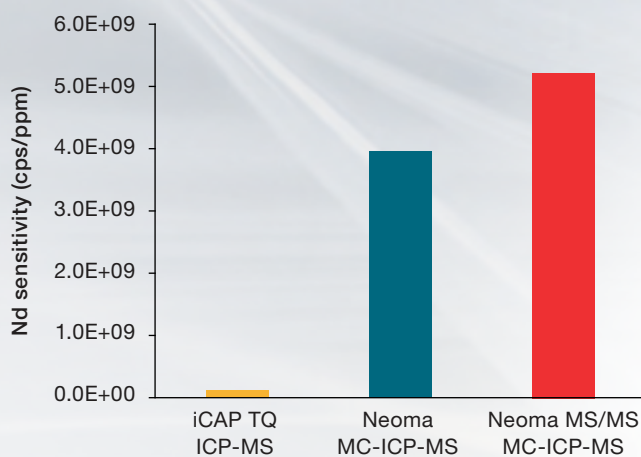
One instrument: a world of possibility

Neoma MS/MS MC-ICP-MS allows you to measure in both standard MC-ICP-MS mode or utilizing the MS/MS technology.

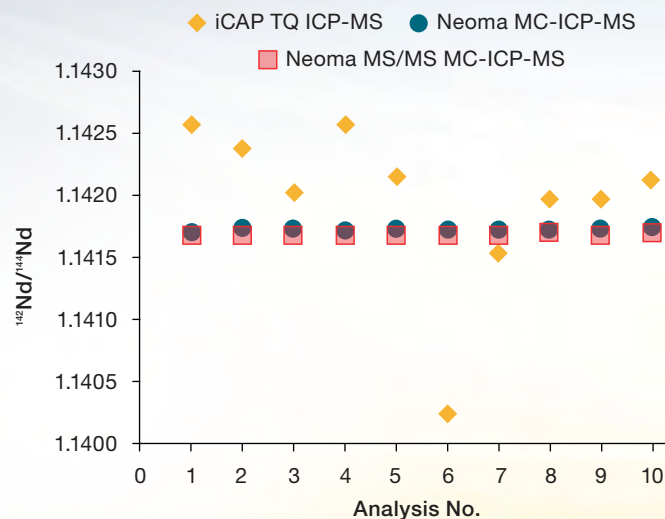
Full transmission mode

With Neoma MS/MS MC-ICP-MS, you have at your disposal a state of the art MC-ICP-MS that you can use for high precision isotope analysis without utilizing the collision/reaction cell technology. This “full transmission mode” provides the same accuracy, sensitivity and precision as you would get with the conventional Neoma MC-ICP-MS.

Additionally, you can use the pre-cell mass filter to remove matrix elements, boosting sensitivity and improving abundance sensitivity.



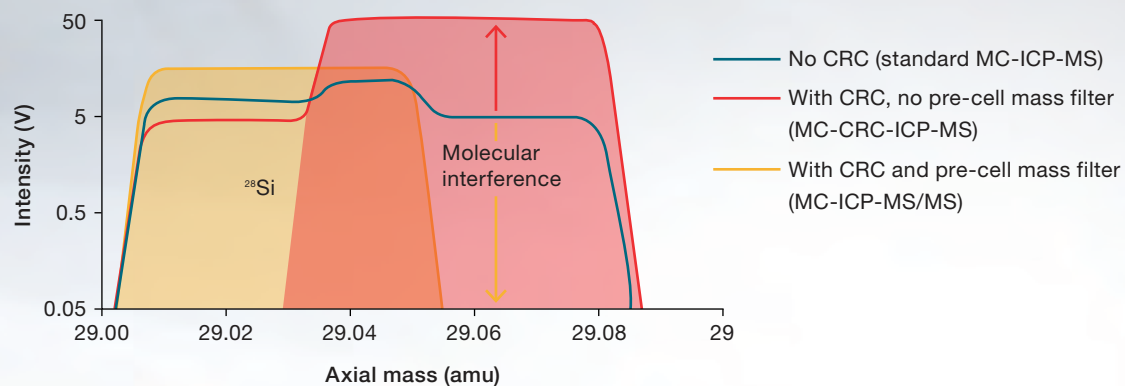
Sensitivity of Neoma MS/MS in comparison to TQ technology and Neoma MC-ICP-MS



Accuracy of Neoma MS/MS in comparison to TQ technology and Neoma MC-ICP-MS

Collision/reaction cell mode

For isotope systems with significant isobaric interferences, the MS/MS technology can be activated. Here, the Neoma MS/MS MC-ICP-MS sets itself apart from other CRC-ICP-MS technologies with the pre-cell mass filter. This patented technology removes matrix elements that might act to cause secondary reactions in the CRC, which in some cases can amplify (rather than eliminate) the isobaric interferences.



Effect of pre-cell mass filtering on Si in HNO₃

Standard MC-ICP-MS, no CRC shown in blue. No pre-cell mass filter, all masses enter CRC (red), resulting in significant increase of the molecular interferences and strong peak tailing onto ²⁸Si. With pre-cell mass filter (yellow), only masses around *m/z* 29 enter the CRC, allowing predictable reaction chemistry, completely suppressing the molecular interferences on ²⁸Si.

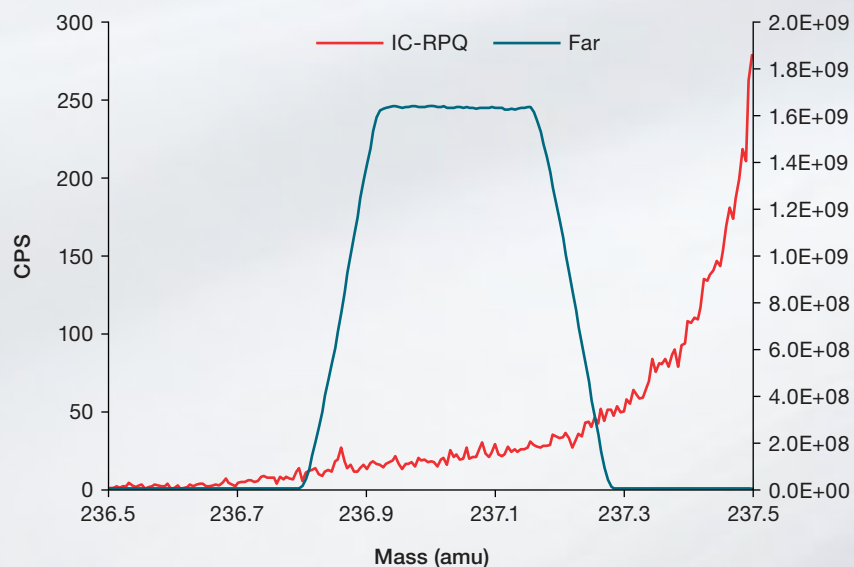
Technology you trust

The new MS/MS technology is built from the robust Neoma MC-ICP-MS platform, providing you with all the benefits of Neoma MC-ICP-MS but with the option of MS/MS functionality for isobaric interference removal.



Extended dynamic range

The new relay system of the Neoma MS/MS MC-ICP-MS has doubled the dynamic range of all ion current amplifiers, allowing you to measure at even greater precision.



Neoma MS/MS removes $^{40}\text{Ar}^+$ early in the mass spectrometer resulting in excellent abundance sensitivity of <50 ppb

Excellent abundance sensitivity

Scattered ions from major isotopes can bias the measured ratios on the neighboring minor isotopes. The Retarding Potential Quadrupole (RPQ) improves abundance sensitivity by an order of magnitude. The Neoma MC-ICP-MS can be configured with two RPQ lenses for simultaneous ^{234}U and ^{236}U analysis.

The pre-cell mass filter of Neoma MS/MS MC-ICP-MS suppresses matrix elements, improving the abundance sensitivity to <50 ppb - close to abundance sensitivities possible in Thermal Ionization Mass Spectrometry (TIMS)!



Extended choice with 24 amplifier array

On the Neoma MS/MS MC-ICP-MS, 24 ion current amplifiers are mounted in a doubly shielded, evacuated and thermostated housing with a temperature stability of 0.01°C/hour, guaranteeing baseline and gain stability. A software-controlled relay matrix connects any amplifier to any Faraday cup, catering to the requirements of any analytical measurement.

Enhanced variable detector array

At the heart of the Neoma MS/MS MC-ICP-MS is our enhanced variable multicollector detector array with 11 Faraday cup detectors. The highly reliable mechanism brings all Faraday cups into precise alignment with ion beams of different dispersions. This ensures the flexibility to cover isotopic applications from Li through to U, in low or high resolution, and without compromising the native dispersion of the mass analyzer.

Examples of how the enhanced detector array of Neoma MS/MS MC-ICP-MS can be fully utilized to improve the precision of specific isotope systems

	L5	L4	L3	L2	L1	C	H1	H2	H3	H4	H5
Ca	³⁸ Ar	³⁹ K	⁴⁰ Ca	⁴¹ K	⁴² Ca	⁴³ Ca	⁴⁴ Ca	⁴⁶ Ca	⁴⁷ Ti	–	⁴⁸ Ca
Ti	⁴³ Ca	⁴⁴ Ca	^{45.5} Zr ²⁺	⁴⁶ Ti	⁴⁷ Ti	⁴⁸ Ti	⁴⁹ Ti	⁵⁰ Ti	⁵¹ V	⁵² Cr	⁵³ Cr
Rb-Sr	⁸⁵ Rb	⁸⁷ Rb	–	–	–	–	–	⁸⁴ SrF	⁸⁶ SrF	⁸⁷ SrF	⁸⁸ SrF

Technology you trust

Additional key features of Neoma MC-ICP-MS and Neoma MS/MS MC-ICP-MS...

Inductively coupled plasma

The iCAP QNova ICP-MS is designed to adapt rapidly to changing sample matrices and provide unparalleled robustness, even for challenging samples. Its field-proven Ar ion source with digital, solid state 27 MHz RF generator is unique. A low ion energy spread results in optimum ion focusing and transmission. Balanced coil technology accounts for ultimate plasma stability.



Jet Interface

The Jet Interface, in combination with a desolvating nebulizer system, increases sensitivity by 10 to 20 times compared to standard wet plasma. With the Neoma MS/MS MC-ICP-MS and the Jet Interface, sample ion yields of greater than 1.5% for uranium and lead are routinely achieved, making it the most sensitive ICP-MS available.

Choice of resolution

The Neoma MS/MS MC-ICP-MS comes with a choice of 3 different mass resolutions for maximizing the sensitivity of your analysis whilst allowing interferences to be resolved.

High-performance Faraday cups

The Faraday cups used in the Neoma MS/MS MC-ICP-MS have been brought forward from the pioneering Thermo Scientific™ Neptune™ Series MC-ICP-MS instruments and are capable of the highest precision static isotope ratio measurements. The combination of the 2x magnification of the mass analyzer, with wide and deep Faraday cups, means that ion beams are captured in their entirety. Precision machined from solid graphite for uniform response; cup factors are eliminated.

Flexibility of detector types

The Neoma MS/MS MC-ICP-MS offers the most flexible detector system available, with three different detector types spanning more than 9 orders of magnitude in signal intensity range (1 cps – 6 Gcps). The central channel of the Neoma MS/MS MC-ICP-MS is equipped with a dual mode detector that can be switched from Faraday cup to SEM ion counter, and with the proprietary relay matrix any amplifier can be assigned to any of the Faraday cups via software.



10¹³ Ω amplifier technology

The 10¹³ Ω Amplifier Technology has revolutionized the measurement of isotope ratios from low intensity ion beams. The Neoma MS/MS MC-ICP-MS is the first MC-ICP-MS designed from inception to incorporate high-ohmic amplifier technology. It ensures fast response times with extremely low noise characteristics. The benefits of Faraday cups can be realized at low signal intensities (30 kcps – 3 Mcps), delivering external precisions that approach the ultimate limits of counting statistics.



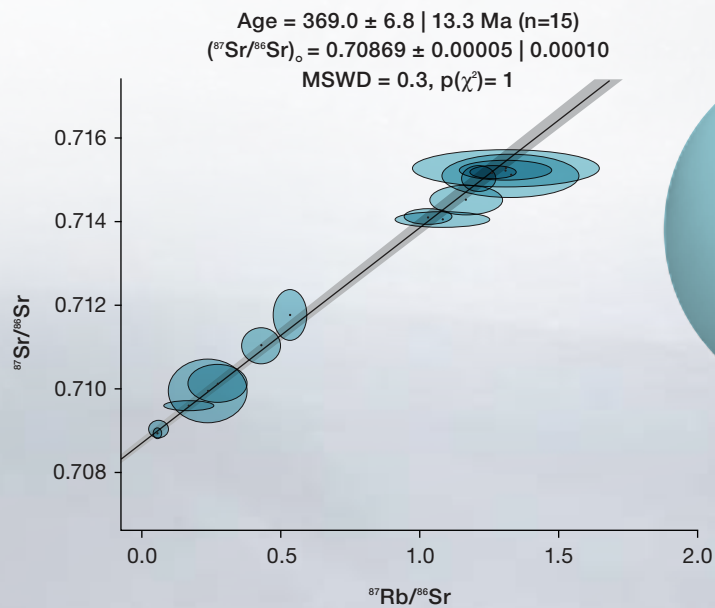
Qtegra ISDS Software

Minimize training, automate workflows, simplify your experience, and improve efficiency with the innovative Thermo Scientific™ Qtegra™ Intelligent Scientific Data Solution (ISDS) Software platform. This shared software approach provides control and data processing for a range of elemental and isotopic analysis technologies including: ICP-OES, ICP-MS, MC-ICP-MS, Noble Gas MS, High Resolution IRMS and gas IRMS. Designed for workflow, scalability, compliance and data management, Qtegra ISDS Software provides essential tools for consistent, accurate analysis.

Expand your horizons

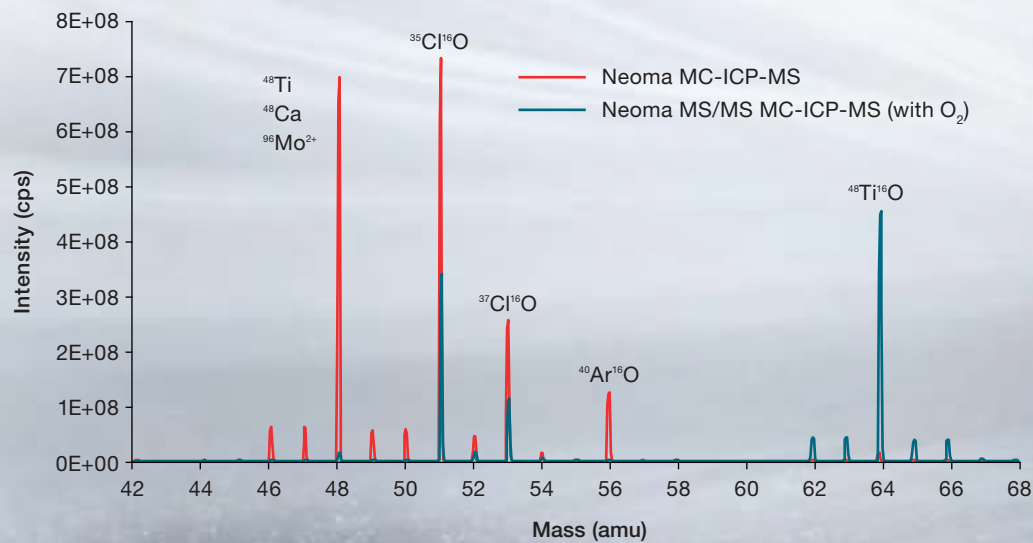
In-situ Rb-Sr dating

The combination of the pre-cell mass filter (for separating out matrix elements), the collision/reaction cell (for separation of ^{87}Rb and ^{87}Sr) and the multicollector detector array means that geological samples can be dated with unprecedented precision.



In-situ Rb-Sr dating of a single crystal with just 15 points and low Rb/Sr variability



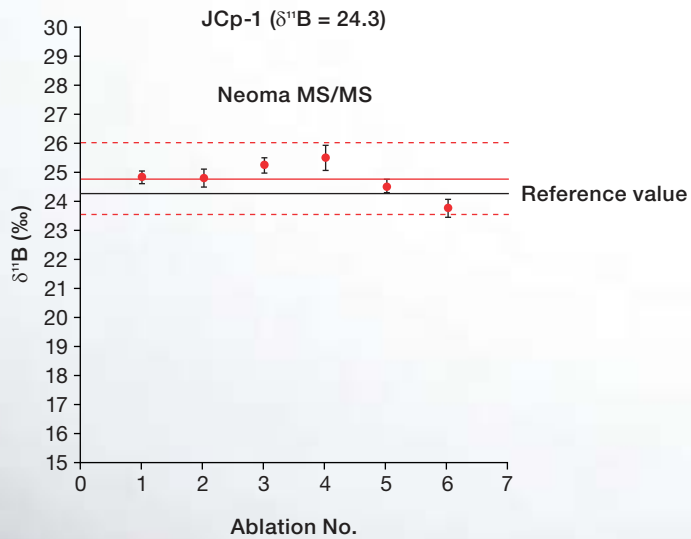


Interference-free Ti isotope analysis

The 5 isotopes of Ti have many potential interferences: (i) isobaric, e.g. ⁴⁶Ca⁺, ⁴⁸Ca⁺, (ii) molecular, e.g. ⁴⁰Ar¹²C⁺, and (iii) doubly-charged e.g. ⁹⁶Mo²⁺. With Neoma MS/MS MC-ICP-MS, the pre-cell mass filter can be used to remove molecular and doubly charged interferences, and the collision/reaction cell can be used to remove isobaric interferences. This allows Ti isotopes to be measured (as TiO) interference-free.

In-situ boron isotope analysis of biogenic carbonates

With the pre-cell mass filter of Neoma MS/MS MC-ICP-MS, there is no longer the challenge of interferences from scattered Ca^{4+} ions on ^{10}B . This means that boron isotopes in biogenic carbonate samples can be analyzed via LA-MC-ICP-MS with unprecedented accuracy.

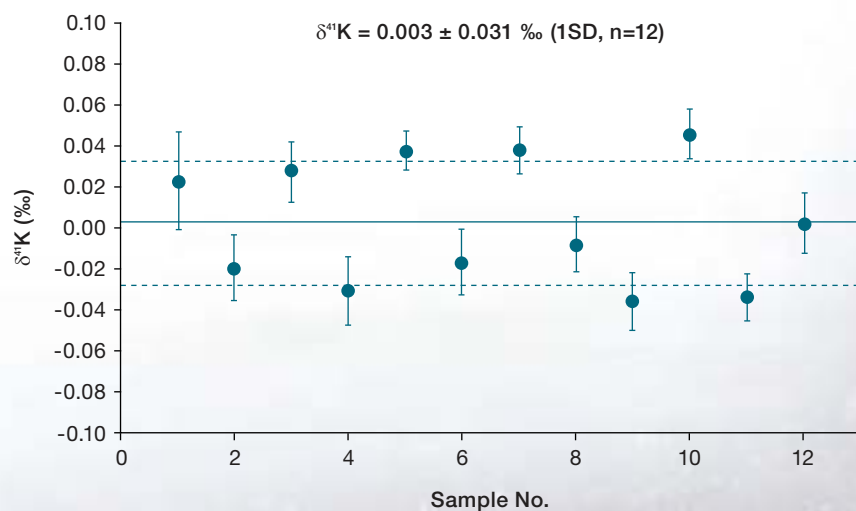


With Neoma MS/MS MC-ICP-MS, boron isotope LA-ICP-MS data from carbonates is accurate without the need for external correction

K isotope analysis

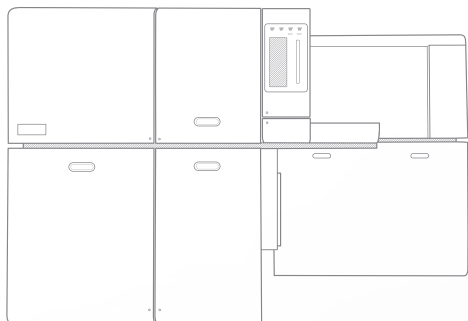
For K isotope analysis, interference of $^{40}\text{Ar}^+$ can hamper the precision and accuracy of the isotopic analysis.

With Neoma MS/MS MC-ICP-MS, there are two options at your disposal for removing the interference: (1) the eXtra High Resolution (XHR) of Neoma MC-ICP-MS, or (2) the use of H_2 and He in the collision/reaction cell to neutralize ^{40}Ar and $^{40}\text{ArH}^+$. The XHR of Neoma MC-ICP-MS resolves K from Ar, producing high precision K isotope data without the use of reaction gases. For smaller sample sizes, the collision/reaction cell of Neoma MS/MS MC-ICP-MS can be used to remove Ar and ArH, ideal for studies where sample limitation would affect precision.



Use of 3.5m L H_2 and 2.5 mL/min He within collision/reaction cell to measure low concentration (25 ng/g K) samples at high precision

Catering for all your MC-ICP-MS needs



Neoma MC-ICP-MS

The ultimate workhorse of isotope ratio mass spectrometry. With extended dynamic range, increased dispersion and a larger collector array, the Neoma MC-ICP-MS is the instrument of choice for most isotope ratio applications.



Neoma MS/MS MC-ICP-MS

For customers wanting to push the boundaries of their science, the Neoma MS/MS MC-ICP-MS goes one step further, allowing easy separation of isobaric interferences. Available as an upgrade pathway from Neoma MC-ICP-MS.

Learn more at [thermofisher.com/msms](https://www.thermofisher.com/msms)

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