TECHNICAL NOTE 44390

Thermo Scientific iCAP TQe ICP-MS and Thermo Scientific iCAP TQ ICP-MS: Typical performance

Keywords: Typical performance, sensitivity

Introduction

Trace elemental analysis techniques are used for the identification and quantification of elements in a wide variety of samples. Since ICP-MS is a technique with high sensitivity and specificity, it is typically used in applications where the lowest limits of detection are required.

The Thermo Scientific™ iCAP™ TQe and the Thermo Scientific™ iCAP™ TQ ICP-MS enable advanced interference removal using different reactives gases combined with an additional mass filtering quadrupole located axially in front of the QCell collision/reaction cell system (CRC). This additional mass filter removes all unwanted ions from the ion beam before they can enter the QCell CRC, hence effectively avoiding possible side reactions and keeping potential product ion masses free from interferences. The iCAP TQe ICP-MS is designed to accomplish interference removal using only helium and oxygen as CRC gases. The system therefore allows to eliminate interferences, which cannot be removed using traditional single quadrupole based ICP-MS, for example doubly charged ions of different rare earth elements on ^{75}As or Se isotopes. The iCAP TQ ICP-MS offers the flexibility to also leverage other reactive gases, for example ammonia, so that in addition other interferences, such as isobaric interferences, e.g. ^{204}Hg on ^{204}Pb, can be removed. Additionally, interferences caused by complex sample matrices, for example, in solutions containing high concentrations of a single element, can be removed with higher confidence.

Both systems were designed on the same proven and successful platform, therefore also enabling effective and comprehensive interference removal using He and kinetic energy discrimination (KED). The Thermo Scientific™ Qtegra™ Intelligent Scientific Data Solution Software allows unique ease of use through the Reaction Finder Method Development Assistant, that automatically selects the most appropriate combination of scan setting (SQ vs. TQ), cell conditions (He KED vs. reactive gases) and product ion mass (where applicable) based on the user´s selection of the element to be analyzed (See Figure 1 for more information).

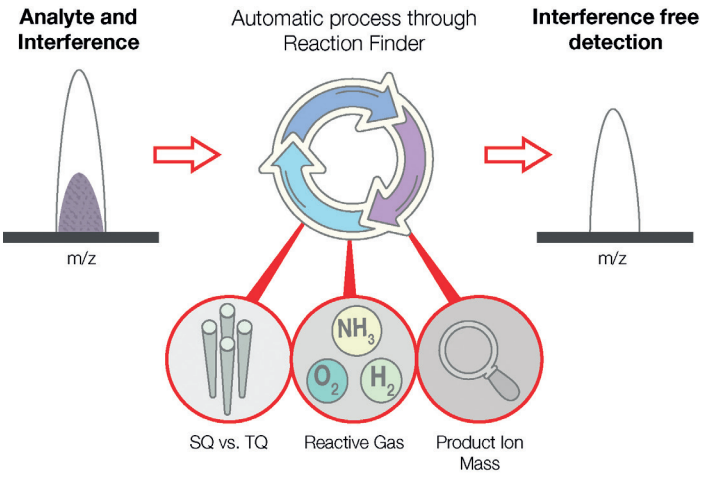

Figure 1. Workflow of the Reaction Finder Method Development Assistant

Before shipping, every instrument is rigorously tested at the ISO 9001 accredited Thermo Scientific Center of Excellence for Mass Spectrometry in Bremen, Germany. After installation at the end user facility, each system is then demonstrated to meet the guaranteed performance levels described by the Product Specifications (PS44472 and PS43281, respectively). These represent the minimum standard. Typically, however, all instruments perform at higher levels, as described in Table 1.

Typical performance values displayed in the following are obtained in a 2% HNO_3, 0.5% HCl matrix (all v/v). The performance at the end user facility is dependent on the laboratory conditions and cleanliness of chemicals and is not demonstrated during installation. Typical detection limits for a variety of elements are available in TN43287.

Table 1. Typical Performance of the iCAP TQe ICP-MS and iCAP TQ ICP-MS. All measurements have been conducted with the default sample introduction system as listed in the product specification, PS44472 and PS43281.

	Guaranteeed performance	Typical performance
Standard mode		
Sensitivity (kcps/ppb)		
^{7}Li	65	130
^{59}Co	150	250
^{115}In	300	500
^{238}U	330	550
Background [cps]		
m/z 4.5	1.0	<0.3
m/z 220.7	1.0	<0.2
Oxides [%]		
CeO/Ce	2.0	<1.8
Doubly charged [%]		
Ce^{++}/Ce^{+}	4.0	<2.6
Stability [% RSD]		
10 mins	2.0	<1.0
2 hrs	3.0	<2.0
Precision [% RSD]		
^{107}Ag/^{109}Ag	0.1	<0.1
He KED mode		
Sensitivity [kcps/ppb]		
^{59}Co	40	>90
Interference reduction factor		
^{59}Co/^{51}[ClO]		>22
Oxides [%]		
^{156}[CeO]/^{140}Ce		<0.6
Background [cps]		
m/z 4.5	0.5	<0.2

Find out more at **thermofisher.com/TQ-ICP-MS**

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