



Agilent ICP-MS Journal

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see page 8 for details!

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Agilent Technologies

An Application of ICP-MS in Chemical Metrology

Mike Sargent, LGC Ltd, Teddington, UK

Introduction

In recent years we have seen increasing demand from users of analytical data and regulators that measurements made in different laboratories, often in different countries, are in agreement. Reasons for this trend include:

- Increasing numbers of analytical measurements used in support of regulations
- Reassurance that the data has rigorously proven reliability.

It is essential that enforcement of a regulation has the same outcome no matter which laboratory made the measurement. In addition, ever-expanding international trade depends on laboratories being able to provide measurement data to a common basis no matter where they are located. To some extent, the requirement can be met by ensuring that every analytical laboratory operates a quality system, with external accreditation where appropriate. It has long been recognized, however, that this alone is insufficient.

The most widely used, and very successful, approach to achieving agreement between different facilities is through laboratory comparisons and proficiency testing (PT) schemes. Laboratory comparisons and PT schemes do, however, have some limitations. Each comparison or PT round is time-consuming and expensive, comparability of results extends only to the relatively small number of participants, there is usually no means of establishing comparability between different comparisons or PT schemes, and it is impracticable to organize them for every routine analytical measurement application. Thus this approach is generally reserved for critical applications where a relatively small number of laboratories must establish that their results are in good agreement.

Traceable Measurements

A potential alternative to using direct comparisons between laboratories is to apply the concept of traceability to chemical analysis [1]. This concept is universally accepted for physical measurements and metrologists have

worked for well over 100 years to achieve international comparability of their measurements on this basis. Traceability works by ensuring that each measurement result of a particular type (e.g. mass, length or time) is traceable to a unique point of reference which is accepted throughout the world e.g. an artefact (standard meter or kilogram) kept at the Bureau of International Weights and Measures (BIPM) in Paris. The international measurement system is, of course, recognized by chemists who use traceable balances, volumetric glassware, thermometers, etc. in their analytical methods. Implementation of an exact analogy to physical traceability has, however, not been possible because analytical measurements are often subject to matrix effects, i.e. the composition of the sample as a whole has a direct effect on the relationship between analyte concentration and the response of the measurement procedure which comprises the last step of a complex method.

Chemical Metrology

In 1993 the International Committee for Weights and Measures (CIPM) recognized the limitations of the existing system with regard to analytical measurements and established a collaborative programme of work in chemistry [2,3]. This programme is organized through the CIPM's Consultative Committee on Amount of Substance (CCQM). The CCQM members are working to resolve the practical difficulties of achieving widely accepted chemical reference measurements and to provide an international structure which enables national and regional laboratories to demonstrate the equivalence of their measurement data. This is being done through a series of key comparisons, which reflect applications relevant to industry, trade, health, environment, etc, as well as by a requirement for appropriate quality management systems. The formal arrangements for this collaboration are set out in a Mutual Recognition Arrangement (MRA) co-ordinated by the BIPM. In the case of chemistry, links to the key comparisons are being achieved by national measurement institutes (NMIs) through provision of traceable certified reference materials (CRM), standards, and calibration services and by encouraging PT schemes to use traceable reference values where appropriate. The key comparisons of the CCQM together with related activities of the CIPM MRA form the

basis for a system of metrology in chemistry.

Role of LGC

LGC acts as the UK NMI for inorganic, organic and bio-analytical measurements. It has participated in the work of the CCQM since its inception and is well-known for its chemical calibration services [4]. These include provision of matrix certified reference materials (CRM), chemical standards, and traceable reference values for PT schemes. *Information about this work, which is part of the DTI Valid Analytical Measurement (VAM) Programme, can be found on the VAM web site: www.vam.org.uk.*

Much, but not all, of the inorganic and organic chemical analysis is based on mass spectrometry, preferably using isotope dilution (IDMS). Analysis using isotope dilution requires the addition to the sample of an isotopically enriched material (often referred to as the 'spike' or 'spiking standard') which acts as an internal standard. Provided the enriched isotope is present in an equivalent state to the natural isotope, it can perform the role of the ideal internal standard and exactly compensate for errors arising at all stages of the analysis, from sample preparation through to the final instrumental measurement.

The rest of this article provides a brief description of two such reference methods based on ICP-MS, together with results from CCQM studies in which their performance was compared with methods used by other NMIs from around the world. These methods are based on an "approximate matching" IDMS technique developed at LGC [5] and are very time-consuming (a single analysis may take several days or weeks). They would not be suitable for routine work but offer many advantages for reference measurements where it is essential to minimize the measurement uncertainty.

Analysis of Tributyltin (TBT) in Sediment using HPLC-ICP-MS

This application is a good example of the benefit of using species-specific IDMS for speciation analysis. Use of the isotopically-enriched species as the spike ensures that both the spike and the natural analyte behave identically during the measurement. This is particularly important at the extraction stage as it is often difficult to achieve complete extraction of

the analyte whilst ensuring that it remains in its original form. With an IDMS measurement, loss of analyte in this way will not introduce an error provided full equilibration of the natural and enriched isotopes is achieved prior to extraction. The IDMS method [6] uses a methanol solution of TBTCI enriched in ^{117}Sn , prepared at LGC, as the spike. Use of double IDMS for calibration against a natural TBT standard of known purity avoids the need for a certified isotopic spike. Sediment samples are extracted by accelerated solvent extraction (ASE) using acetic acid/methanol (50/50 v/v) as the extraction solvent. The spike solution is added to each cell before extraction. Each cell is extracted at 100°C and 1500psi pressure using a preheat of 2 minutes and 5 cycles of 5 minute duration, followed by a 100 second flush with nitrogen. The extracts are diluted two-fold with ultra-pure water prior to HPLC-ICP-MS under the following conditions.

HPLC Conditions:

Agilent 1100 HPLC with thermostated autosampler and column compartments
Column: C-18 ACE $3\mu\text{m}$ particle size, $2.1\text{mm} \times 15\text{cm}$.

Mobile phase: 65:23:12:0.05 v/v/v/v Acetonitrile/water/acetic acid/triethylamine.

Flow rate: 0.2 mL min^{-1}

Injection volume: $50\mu\text{L}$

ICP-MS Conditions

Agilent 7500i ICP-MS

Isotopes monitored: ^{120}Sn , ^{117}Sn .

Integration time: 0.3 seconds

Cones: Pt

O_2 added to avoid carbon build-up on cones and interface.

The Agilent Technologies ICP-MS chromatographic software (G1824C Version C.01.00) is used for integration of the chromatographic signal and peak areas are entered into IDMS spreadsheets developed at LGC.

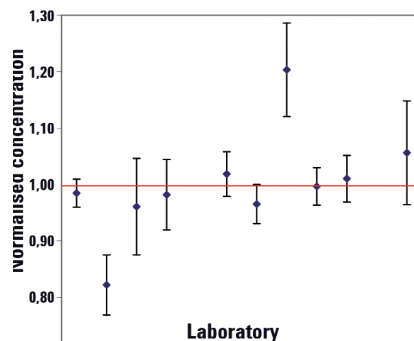
This method was used by LGC in a CCQM key comparison (CCQM-K28) which involved analysis of TBT in a sediment sample provided by NRC in Canada. Our reference value of 1.046 nmol g^{-1} (with an expanded uncertainty ($k=2$) of 0.093 nmol g^{-1}) proved to be in excellent agreement with the other NMIs, as shown in Figure 1. For clarity, the results are normalized against the consensus value for the study.

Analysis of Selenium (Se) in Salmon using ICP-MS with a Collision Cell

This analysis also uses LGC's

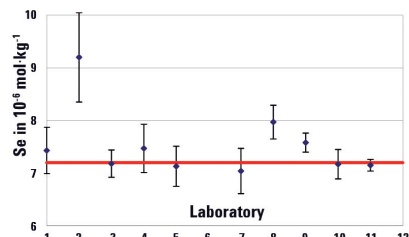
"approximate matching" IDMS technique with double IDMS to allow calibration against a natural standard. In this case it illustrates how modern ICP-MS instrumentation

Normalised results for TBT in sediment, CCQM-K28 (LGC is Lab 3)



can overcome problems which may cause serious errors even when using IDMS. The mass spectral interference due to $^{40}\text{Ar}^{40}\text{Ar}^+$ is well-known as a serious problem for measurements of the major isotope of selenium, $^{80}\text{Se}^+$, but Ar-dimer isotopic combinations potentially interfere with most of the Se isotopes. Use of an Agilent 7500ce ICP-MS with a collision cell for measurement of the $^{78}\text{Se}/^{77}\text{Se}$ isotope ratio helps to significantly reduce these isobaric interferences. A ^{77}Se spike solution prepared at LGC is added to a 0.4g sample aliquot prior to microwave digestion in a quartz vessel using nitric acid (4mL) and hydrogen peroxide (2mL). After digestion, the digest solutions are diluted by weight to 16g with deionised water before measurement of the $^{78}\text{Se}/^{77}\text{Se}$ isotope ratio. The collision cell gas is H_2 with a flow rate of 3.5 mL min^{-1} , used with an ICP RF power of 1500 W and a carrier gas flow rate of 0.92 mL min^{-1} . The method was compared with those of other NMIs in a recent CCQM key comparison (CCQM-K43), a study which involved analysis of several elements, including Se, in a salmon sample. The LGC reference value was 7.04 mmol/kg with an expanded uncertainty ($k=2$) of 0.034 mmol/kg which is again in excellent agreement with the other NMIs, as shown in Figure 2.

Results for Se in salmon (CCQM-K43) LGC is Lab. 7



Conclusions

Achieving traceable analytical measurements through implementation of the principles of chemical metrology depends on the availability of reference values with minimal bias and small measurement uncertainty. The use of modern ICP-MS instrumentation greatly facilitates the provision of reference values for inorganic analytes using isotope dilution mass spectrometry (IDMS). This approach has been illustrated with two examples, for both of which the data obtained by LGC have been compared with that from other NMIs around the world through participation in CCQM key comparisons. Proven measurement capability of this type is essential for applications such as certification of matrix reference materials and provision of reference values for PT schemes. Further detailed information on all aspects of metrology is available on the BIPM web site (<http://www.bipm.org/en/home/>). Full reports of CCQM-K28 and CCQM-K43, or any other key comparison, may be obtained from the Key Comparison Database (KCDB) maintained by BIPM (<http://kcdb.bipm.org/>).

References

1. Traceability. M Sargent in *Encyclopaedia Of Analytical Science*, Ed. P Worsfold, pp 477-485, Academic Press, Oxford, UK, (2005). ISBN: 0-12-764100-9.
2. The UK Chemical Calibration Facility at LGC, M Sargent, The VAM Bulletin, Issue No. 27, 18-22, (LGC, Teddington, UK, Autumn 2002).
3. Metrology in chemistry: a different approach to comparable analytical results. M Sargent, J. Anal. At. Spectrom., 20, 1017-1018 (2005).
4. UK delivery of traceable chemical measurements in the 21st century: building on the foundation of the VAM programme. M Sargent, Accreditation and Quality Assurance, 8(10), 480-482, (2003).
5. Guidelines for achieving high accuracy in IDMS, M Sargent, R Harte, C Harrington, RSC, Cambridge, UK, (2002). ISBN: 0-85404-418-3.
6. A comparison of GC-ICP-MS and HPLC-ICP-MS for the species-specific isotope dilution analysis of TBT in sediment after accelerated solvent extraction R Wahlen, C Wolff-Briche, Anal. Bioanal. Chem., 377(1), 140-148, (2003).

Acknowledgements

The ICP-MS measurements were carried out by the Inorganic Analysis Team at LGC, particularly J. Entwisle, R. Hearn and R. Wahlen. The CCQM key comparisons were organized by R. Wahlen and C. Wolff-Briche of LGC, R. Sturgeon of NRC, and Y. Aregbe of IRMM. The chemical metrology work at LGC is supported by the DTI VAM Programme.

User Profile: LCABIE Drives Speciation Analysis Across Disciplines

Maité Bueno, Florence Pannier,
LCABIE, Hélioparc, Pau, France

Introduction

Common interest in the analysis of chemical forms of trace elements brought together the Analytical Chemistry Group at the University of Pau (led by Martine Potin Gautier, ex colleague of Professor Michel Astruc) and the Bioinorganic Analytical Chemistry Group (led by Ryszard Lobinski) to establish a modern ICP-MS facility in Hélioparc (Pau) known as Laboratoire de Chimie Analytique Bio-Inorganique et Environnement (LCABIE). The team at LCABIE is dedicated to speciation-related research in environmental, food, and clinical chemistry.

Role of ICP-MS

Two 7500ce ICP-MS have been purchased since 2003 and are currently used coupled to laser ablation, GC and LC (including capillary and nano-LC). These two collision/reaction cell (CRC) instruments have proved particularly useful for the detection of elements plagued by polyatomic interferences (e.g. selenium). The upgrade of one of the instruments - adding a 3rd cell gas line for xenon introduction has made possible the accurate determination of the sulfur isotopes. This current set up of quadrupole ICP-MS at the LCABIE is the result of an on-going collaboration with Agilent which started in 1997 with the installation of a 4500 and the beta testing of a transfer line for GC coupling [1].

The research group benefiting from the ICP-MS facility consists of 10 permanent scientists and a dozen post-docs and Ph.D. students. Their main application areas of interest include trace element analysis in water, sediments and biota, interaction of metals and metalloids with living organisms, and development of technologies for treatment of industrial effluents contaminated by metallic pollutants. The key concern is speciation analysis - defined by IUPAC as "analytical activities of identifying and/or measuring the quantities of one or more individual chemical species in a sample" [2]. It is the chemical form of an element that governs its toxicity, essentiality, biological activity, bioavailability and environmental impact. Therefore, speciation information has become a key issue in numerous fields including environment, medicine, agriculture, food and nutrition, toxicology, industry, etc.

The major challenge to speciation analysis is the development of analytical methods coupling effective separation techniques and specific detection (hyphenated methods). With the growing demand for such analytical activities beyond scientific research, it is important that developed and validated methods are transferable to routine laboratories.

Classical HPLC Coupling

Various HPLC separation modes have been coupled to ICP-MS (acting as the detector) mainly for "routine" analysis of As and Se. For example, cation exchange chromatography is used to quantify arsenic species in landfill leachates [3]. For selenium species, water analysis is performed either by anion exchange or porous graphitic carbon stationary phases [4, 5]. The combination of several separation modes such as reversed phase, size exclusion, ion exchange

(multidimensional chromatography) is used to purify unknown biological compounds (further identified by electrospray and MALDI MS techniques). The improvement in detection limits offered by CRC-ICP-MS is particularly profitable for metalloids suffering from argon-related interferences, as shown in Table 1.

ICP-MS	Se DL (ng/L)		
		Tot	Species
7500c - No gas	⁸² Se	110	130-350
7500c	⁷⁸ Se	50	140-320
3.8 H ₂ + 0.5 He	⁸⁰ Se	40	70-80
7500ce	⁷⁸ Se	6	14-30
5 H ₂ + 0.5 He	⁸⁰ Se	4	7-15

Table 1: Optimized operating CRC conditions and corresponding Se detection limits (ng/L). Cell gas flow rates in mL/min

Downscaling LC Separation

The miniaturisation of HPLC is an important challenge to bioanalytical chemistry e.g. when an amount of less than several micrograms of a rare sample is available or when biological processes in single cells or in sub-cellular entities need to be investigated. The use of these nanoflow separation techniques including capillary and nano-HPLC is difficult with ICP-MS because of the flow rates being 100-1000 lower than conventional nebulizers. However, our lab has developed dedicated interfaces based on high-efficiency, low-sample consumption, zero dead volume sample introduction systems. The first sheathless interface was developed between capillary HPLC (300 µm column i.d.) and ICP-MS for selenopeptide mapping in a protein fraction from a selenized yeast extract with absolute detection limits 100 to 150 lower than reported for HPLC-ICP-MS [6]. For even lower volumes of sample, a novel nebulizer (nDS-200) working at sample uptake of less than 500 nL/min was

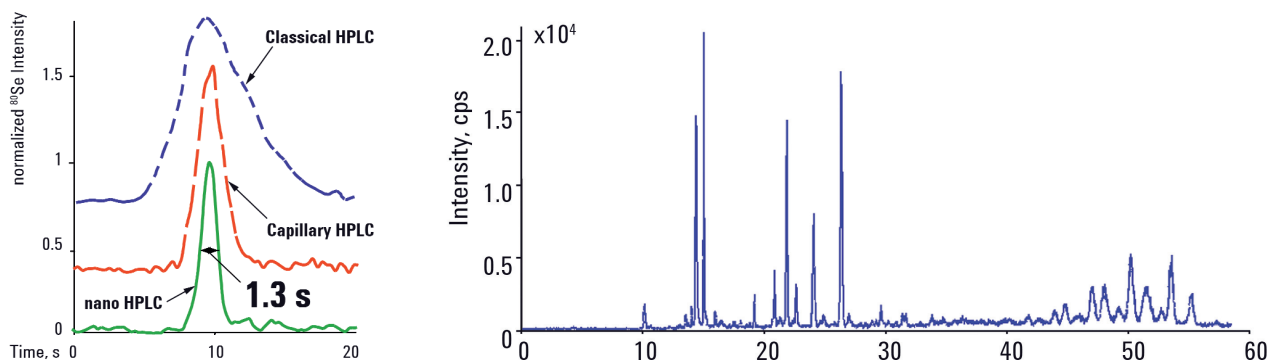


Figure 1. a) Effect of the column and interface on the peak shape in HPLC-ICP MS coupling: Analysis of a 250 µg/L selenomethionine standard (Conditions C18, isocratic 30% ACN); b) cHPLC-ICP-MS chromatogram of a tryptic digest of selenium proteins from yeast.[6,7]

developed for a sheathless interfacing of nano-HPLC (75 μm column i.d.) with ICP-MS, with absolute detection limits of 25 fg of Se [7].

Figure 1 shows the comparison of the peak shapes and resolution gain for selenomethionine under the same chromatographic conditions using the three different LC couplings.

Laser Ablation-ICP-MS

To analyze in-situ trace elements in solid materials the coupling of laser ablation (LA) with ICP-MS has also been investigated. This technique is particularly suitable for the detection of heteroatoms containing proteins or metal biomolecular complexes separated by mono or bi-dimensional gel electrophoresis. The use of the LA allows the localisation of the compounds of interest, which can be further extracted from the gel for MS analysis. Figure 2 presents an example of a total extract of selenized yeast for localisation of selenium containing proteins separated on a mono dimensional gel.

Isotope Dilution Capillary HPLC-ICP-MS

A method for the accurate determination of selenoamino acids in human serum by HPLC-ICP-MS was developed using the species-specific isotope-dilution analysis principle. A serum sample was enzymatically digested with a mixture of lipase and protease after derivatization of the selenocysteine residues with iodoacetamide. The selenoamino acid fraction was isolated by size-exclusion LC followed by the separation of selenomethionine and the carboxymethylated selenocysteine by capillary HPLC. The isotope specific determination of ^{77}Se and ^{80}Se was achieved on-line by CRC-ICP-MS allowing the removal of polyatomic interferences.

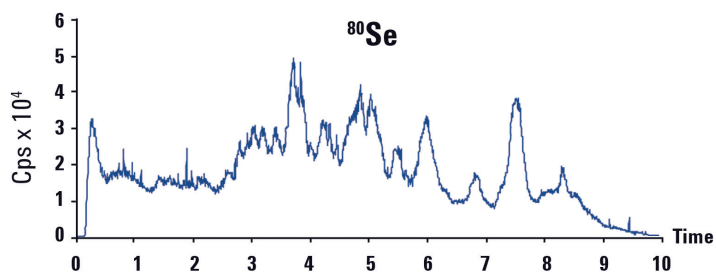


Figure 2. Analysis of total extract of selenized yeast by gel electrophoresis LA-ICP-MS [8].

Quantification was carried out by isotope dilution using a ^{77}Se -labelled selenomethionine spike and the determination of the $^{77}\text{Se}/^{80}\text{Se}$ ratio in the cHPLC - selenomethionine peak [9], see Figure 3.

Isotopic Dilution for Volatile Compounds Quantification by GC-ICP-MS

Isotopic dilution was also developed for quantification of organomercury and organotin compounds in various environmental and biological samples analyzed by GC-ICP-MS, after careful optimization of separation and detection parameters to obtain good precision and performances. After spiking with the isotopically enriched species: (^{117}DBT , ^{117}TBT , Me^{202}Hg , $^{199}\text{Hg}^{2+}$), extraction of sample is performed by either microwave or sonication assistance before ethylation.

A detection limit of 1 pg/L for ^{202}Hg in water was obtained from a 2 μL injection using Reverse Isotopic Dilution (RID). The DL for ^{202}Hg in biological tissue was 12 pg/L and 20 pg/L in blood. The DL's for ^{120}Sn

were 3pg/L in water and 30pg/L in biological tissue.

Acknowledgements

The authors wish to thank all the members of the team involved in these developments for their precious help.

References

- [1] Anal. Chem., 1999, 71, 4534-4543
- [2] Pure Appl. Chem., 2000, 72, 1453-1470
- [3] Proceedings of "10th International Waste Management and Landfill Symposium" 2005
- [4] J. Anal. Atom. Spectrom., 2005, 20, 88-94
- [5] J. Chromatogr. A, 2006, in press
- [6] Anal. Chem., 2003, 75, 6837-6842
- [7] Anal. Chem., 2006, 78, 965-971
- [8] L Tastet, unpublished results.
- [9] Anal. Chem., 2004, 76, 6635-6642

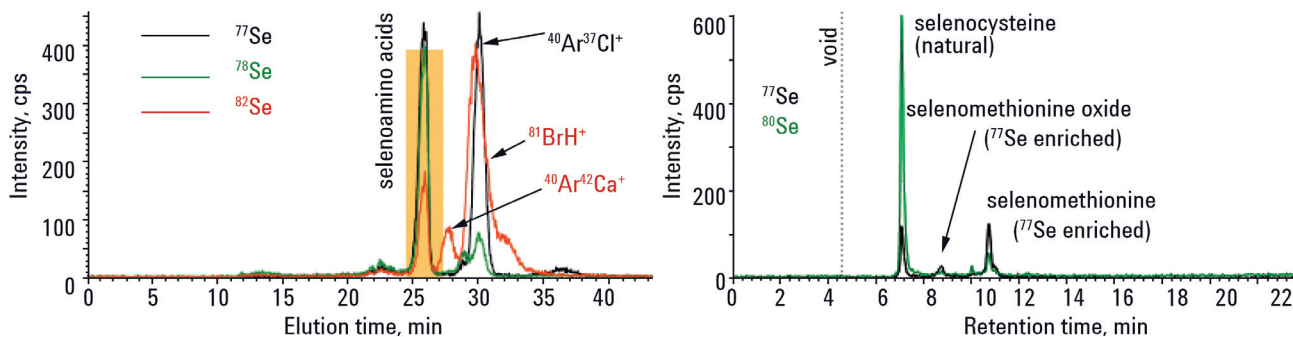


Figure 3. Quantification of selenomethionine in serum by 2D SEC - cRP HPLC - ICP MS. a) Size-exclusion ICP MS (no collision cell) chromatogram; b) cHPLC-ICP-MS with collision cell. Total Se: 71 + 7 ng/g, total seleno amino acids: 63.1 + 2.8 ng Se/g, selenomethionine: 12.6 + 0.4 ng Se/g, selenocysteine (50.5 + 2.5 ng Se/g) [9].

Service and Support News:

Non-Agilent Consumables for 7500 and 4500 Series

Glenn Carey, Agilent Technologies

As the userbase of the Agilent 7500 Series grows year on year, so too does the sale of performance-critical related consumables manufactured and supplied by unauthorized dealers. It is understandable that users will purchase non-Agilent consumables which are often sold as Agilent equivalent and are typically 20-40% lower in price than genuine parts.

Unfortunately we are seeing a higher incidence of failure of these parts, which can result in downtime and a costly repair bill. Most often, when an Agilent ICP-MS isn't working as normal, the user will call Agilent to diagnose and repair the instrument. If the problem is diagnosed to be caused by a non-Agilent consumable, the customer will be charged for the engineer time and parts used during the repair.

Consumables that are copied most often are the sample cone, skimmer cone, torch, and spray chamber.

Sample Cones

The main problem with non-Agilent sample cones is the junction between the copper base and the nickel or platinum insert. If the insert is not attached correctly, a vacuum leak can occur, which reduces the performance of the interface zone. In addition, the tip of the cone will no longer cool correctly because of poor conductance between the copper base and the nickel or platinum insert.

Case Study

I received a (non-Agilent) cone from a customer recently where it was possible to push the insert out of the copper base with little effort. The cone was made from a material mix not used by Agilent: copper base, 25 mm nickel insert with a 7 mm platinum insert.

Skimmer Cones

The problems encountered with non-Agilent skimmer cones are similar to the sample cone issues,

although the issue is more complex because of the many different types of skimmer cone: 4500, 7500a, 7500c, 7500 (T mode), 7500ce and 7500cs (platinum). The manufacturing detail of each different cone is critical.

Torch

The common design fault with non-Agilent torches is subtle and regards the position of the plasma gas connector arm. If this is incorrectly positioned, ignition can be extremely difficult when using the shield.

Spray Chamber

Again the fault we have seen with some non-Agilent spray chambers is subtle and regards the location of the drain port. If this is incorrectly positioned, it won't fit onto the drain seal correctly, causing an air leak; this in turn can lead to ignition problems.

Agilent Consumables

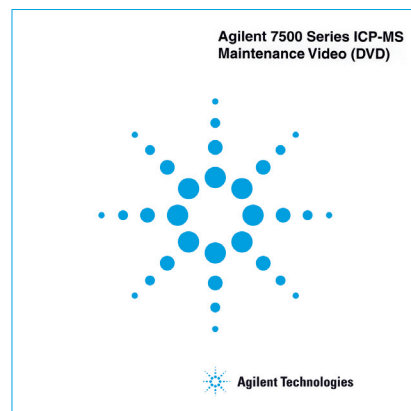
The Agilent logo is now stamped on authentic, Agilent consumables including sample cones, skimmer cones, torches and spray chambers. Insure you are using consumables with the Agilent logo: its your guarantee for instrument performance and reliability.



Look out for the Agilent logo on authentic consumables

New Maintenance DVD Released for 7500 Series ICP-MS

Hidenori Koide, Agilent Technologies



The latest edition of the maintenance video has been released and is available on DVD. This DVD contains an easy-to-use menu that combines over 3 hours of video, text instructions and detailed maintenance parts lists to keep you up-to-date on the latest techniques and support parts for the 7500 Series ICP-MS.

New features include:

- Installing the sample line connector block and internal standard tubing kit
- A new method for cleaning the Sampling and Skimmer cones
- Maintaining the Micro Flow nebulizer
- Maintaining the 7500ce and 7500cs lenses
- Disassembling the Octopole Reaction System cell
- Cleaning the Octopole
- Testing after maintenance

The Agilent part number for the DVD is G3270-65100.

7500cs and 7500ce users will receive their copy of the DVD directly from their Agilent engineer, free of charge. If you do not receive your DVD, please contact your nearest Agilent contact center.

7500a users are encouraged to order a copy of the DVD through their local Agilent contact center.

Interface Cone Part Number Guide for Agilent 7500 ICP-MS

The following table has been compiled to help 7500 Series users identify which sampling cone, skimmer cone or base plate is the right one for their instrument. Operators can check at a glance which part is standard (std) or suitable (x) for their model.

Sampling cone		7500a	7500i	7500s	7500c	7500ce	7500cs	T-mode
G1820-65238	Ni Sampling Cone	std	std	x	std	std	x	
G1820-65239	Pt Sampling Cone (10 mm Insert)	x	x	std	x	x	std	
G1820-65360	Pt Sampling Cone (18 mm Insert)	x	x	x	x	x	x	
G1820-65480	Ni Sampling Cone for T-mode	T-mode	T-mode	T-mode				x
Skimmer cone		7500a	7500i	7500s	7500c	7500ce	7500cs	T-mode
G1820-65050	Ni Skimmer Cone	std	std	x				
G3270-65024	Ni Skimmer Cone for 7500ce					std		
G1833-65497	Ni Skimmer Cone for 7500cs				std		x	
G1820-65237	Pt Skimmer Cone	x	x	std				
G1833-65092	Pt Skimmer Cone for 7500c				x			
G1833-65132	Pt Skimmer Cone for 7500ce and 7500cs					x	std	
G1820-65481	Ni Skimmer Cone for T-mode	T-mode	T-mode	T-mode				x
Skimmer base		7500a	7500i	7500s	7500c	7500ce	7500cs	T-mode
G1833-65407	Stainless skimmer base for Ni Skimmer	std	std	x				x
G1833-65591	Stainless skimmer base for Ni Skimmer (ce,cs)					std	x	
G1833-65498	Stainless skimmer base for Ni Skimmer (7500c)				std			
G1833-65408	Brass skimmer base for Pt Skimmer	x	x	std				
G1833-65505	Brass skimmer base for Pt Skimmer (7500c)				x			
G1833-65590	Brass skimmer base for Pt Skimmer (ce,cs)					x	std	

Key: x Can be used on this model, to extend the analytical capability e.g. higher acid concentration or higher matrix tolerance
std Fitted as standard when instrument is shipped

Notes:

- 18mm Pt cone insert is recommended for measuring H₂SO₄ above 2%
- Pt T-mode cones are not available
- T-mode is not used with ORS models

Choice of Preventive Maintenance Program for 7500 Series ICP-MS

David Wilkinson, Agilent Technologies

Following a review of the 7500 Series ICP-MS Preventive Maintenance (PM) program, some significant changes have resulted which will allow our customers to maximize uptime by adhering to the recommended service intervals for the vacuum system - all at a reasonable price:

- Two PM products have been created: a Major and a Minor PM
- The Major PM (R-20L) is comprehensive, involving all steps of the previous PM but with the addition of:
 - A complete clean of the ion lenses
 - Replacement of the octopole for ORS instruments
- The Minor PM (R-20R) involves changing the rough pump oil and checking the instrument.

Revamping the PM protocols was done to allow our customers to run at top performance, since regular scheduled Preventive Maintenance reduces downtime and repair costs.

Studies of instrument repair calls on Agilent's analytical systems conclude that over 60% of all repairs are not functional failures but are mainly due to lack of preventive maintenance. However, if a customer implements a thorough maintenance program, the overall failure rate for mechanical systems decreases by up to 25%.

Why Two PM Packages?

Agilent has always recommended changing the rough pump oil at six monthly intervals for its ICP-MS products. To obtain this service from Agilent in the past was expensive since it was only available as part of a full PM. Now customers have greater flexibility in managing the PM for their instrument. Furthermore, with the addition of ion lens cleaning for all instruments,

and octopole replacement for ORS instruments, the value of the Major PM is greatly enhanced.

Major PM

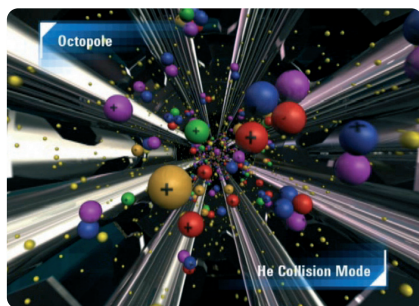
- Order number R-20L
- Included with support bundles 21B and 21P
- Includes cleaning of all ion lenses
- Replacement of the Octopole for ORS instruments

Minor PM

- Order number R-20R
- Not included with any support bundles - needs to be purchased in addition to 21A, 21B or 21P.
- Customers can purchase additional minor PM's in the year if their application requires greater frequency of vacuum system maintenance.
- The Minor PM can only be purchased in conjunction with a Major PM, as the Minor PM does not include sufficient maintenance items to improve instrument performance or uptime by itself.

New ICP-MS Video Online

Take a Close Look at the Agilent
7500ce ORS



This new 7-minute video describes the main components and principles of an ICP-MS system, featuring the Agilent 7500ce. Of special interest is an animated sequence showing every stage of a sample's journey through the ICP-MS - from the sample vial through to the detector, including an "ion's eye" view of the journey through the ion lenses, collision cell and mass analyzer. This visualization of the processes involved in ICP-MS will aid understanding of the technique.

A link to the ICP-MS video web page can be found at www.chem.agilent.com/icpms where the video can be downloaded in Windows Media File (.wmv) format.

Trade Shows and Conferences

Pittcon 2006
March 12-17, 2006
Orlando, Florida, USA
www.pittcon.org

**18th International Symposium on the
Forensic Sciences**
2 - 7 April
Fremantle, Western Australia
www.anzfss2006.org.au

Nordic Plasma 2006
June 11-14, Loen, Norway
www.nordicplasma.com

6th ISSEBETS
21-25 June 2006, Bialowieza, Poland
<http://www.eurocongress.com/pl/issebets2006>

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New Agilent ICP-MS Users

A very warm welcome to the following companies and institutions that have recently added an Agilent ICP-MS to their analytical facilities.

• Tsumura Medicine Company, China • Tang-Shan Waste Water Treatment Factory, China • The National Forensic Testing Center, China • The National Ocean Research Testing Center, DaLian, China • Arkema, France • Laboratoire Central de la Police de Paris, France • Labor Dr Wessling 3 Altenberge, Germany • Labor Dr Wessling 4 Opin, Germany • LUA Bremen, Germany • Merck 2, Germany • MUVA Kempten, Germany • Schott, Germany • TUV Munich, Germany • UFZ Leipzig, Germany • Kerry County Council, Ireland • ENI Spa per San Nazzaro dei Burgundi, Italy • Istituto San Michele All' Adige Trento, Italy • JRC ISPRA II, Italy • Neutron, Italy • Pluri Acque Salerno, Italy • SGS Ecologia, Italy • Analytico Agrifood, Netherlands • Victoria University, New Zealand • IAEA Minsk, Russia • Belgrade Health Institute, Serbia • Hydrometrological institute of Serbia, Serbia • BOC Edwards, Singapore • Escom Koeberg, South Africa • CNTA Laboratorio del Ebro, Spain • Lab Sanidad Albacete, Spain • Ministerio de Agricultura, Spain • Univ Pais Vasco, Spain • Universidad Autónoma de Barcelona, Spain • Universitat de Barcelona, Spain • CENPRO Technology Co., Ltd, Taiwan • Macronix International Co., Ltd, Taiwan • TAC TRI, Taiwan • Yeou Fa Chemical Co., Ltd, Taiwan • Toppoly Optoelectronics Corp, Taiwan • Atomic Weapons Establishment II, UK • AWE, UK • University of Birmingham, UK • Battelle Memorial Institute, USA • Brooks AFB II, USA • California Air Resources Board, USA • Commonwealth of Kentucky, USA • EKC II, USA • EP Scientific, USA • First Solar, USA • Global Nuclear Fuels, USA • Huntington Alloys Special Metals, USA • LA County Sanitation, USA • Micron Idaho II, USA • Mitsubishi Polycrystalline Silicon, USA • Mykrolis Integris, USA • Philadelphia Water, USA • STL Denver, USA • STL Edison, USA • UCLA, USA • Univ of California -Riverside, USA • University of Texas at Austin, USA • University of Utah, USA • Washington University, USA • Xenco III, USA • Marine Environmental Monitoring & Analysis Centre, Vietnam •

Winter Plasma Conference 2006 Report

The Winter Plasma Conference recently took place in Tucson, Arizona (Jan 8-14th 2006) and was a great success. Attendance was the highest for several years with almost 550 conferees and exhibitors attending. The scientific program was excellent, as was the great setting in the high desert. For most of us it was great to actually see the sun for a few days! Agilent took a large contingent of ICP-MS staff with almost 30 of us attending. Displayed on the Agilent booth was the new 7500ce video which was very well received by the conferees.

The famous Agilent ICP-MS user meeting was once again a great success with over 140 people enjoying a great evening. Something new at the user meeting for this year was a game show - hosted as always by Agilent's Chris Scanlon. This year we played "Who Wants to be a Counts Per Second Millionaire?" The "CPS Millionaire" winner was Juris Meija from NRC, who received an Apple iPod. Here's looking forward to the next Winter Plasma Conference in Taormina, Sicily, in 2007!

Agilent ICP-MS Publications

To view and download these latest publications, go to www.agilent.com/chem/icpms and look under "Library Information"

Primer: ICP-MS Primer, 5989-3526EN

App Note: Determination of Impurities in Semiconductor Grade Hydrochloric Acid Using the Agilent 7500cs ICP-MS, 5989-4348EN

App Note: RoHS/ELV Directives - Measurement of Heavy Metals using ICP-MS, 5989-3574EN

Agilent ICP-MS Journal Editor

Karen Morton for Agilent Technologies
e-mail: editor@agilent.com



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