



# Agilent ICP-MS Journal

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**Agilent Technologies**

# Operating Principles of the Agilent Octopole Reaction Cell

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## Multielement Analysis

Many studies of the performance of collision/reaction cell (CRC) devices in ICP-MS have focused on the efficiency with which individual interfering species may be attenuated, to reduce overlaps on individual analytes. This is of great academic interest and improves understanding of the ion/molecule processes that take place in the cell. These studies, however, give little insight into the ability of a CRC-ICP-MS to perform trace multielemental analysis on unknown, high matrix samples. This ability is critical to the usefulness of CRC-ICP-MS in the routine lab.

The Agilent Octopole Reaction System (ORS) has been designed specially for this purpose, typically operating with cell gases ( $H_2$  and He) that do not react to any great degree with analytes (so sensitivity for uninterfered analytes is maintained) or form cluster ions (so formation of new interferences on previously uninterfered analytes is minimal).

Operating in both reaction ( $H_2$ ) and collision (He) modes, the ORS enables the trace analysis of normally interfered analytes in even the most complex matrices - without the need for prior method development or knowledge of the sample matrix.

## Ion-Molecule Reaction - Hydrogen Mode

Reaction mode is used for the efficient removal of the intense peaks due to plasma-based species, such as  $CO^+$ ,  $N_2^+$ ,  $Ar^+$ ,  $ArO^+$  &  $Ar_2^+$ . The reactions in  $H_2$  mode are:

*H atom transfer* ( $M^+ + H_2 \rightarrow MH^+ + H$ ) and

*Charge transfer* ( $M^+ + H_2 \rightarrow M + H_2^+$ )

Both reactions are endothermic for most metal ions, so reaction losses are low, however reaction efficiency with several polyatomic species is very high. Figure 1 shows how the  $ArO$  signal intensity decreases exponentially with the reaction gas flow, which means ion molecular reactions remove  $ArO^+$  effectively in  $H_2$  mode (1).

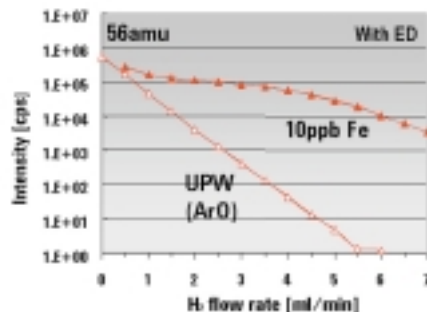


Figure 1. Intensities of  $ArO$  and Fe vs.  $H_2$  flow rate

## Energy Discrimination - Helium mode

Interference removal with He in collision mode does not rely on specific reaction pathways; all polyatomic species are removed - essential for unknown matrices. Efficiency in collision mode is greatly improved by Agilent's ShieldTorch System, which produces ions with very low and uniform ion energies. Polyatomic ions, being larger than monatomic analyte ions, undergo more collisions with the He cell gas, and lose more energy. Kinetic Energy Discrimination (ED) reduces polyatomic interferences using the difference between the DC offset voltages of the octopole and quadrupole (analyzer). The potential barrier at the entrance of the quadrupole excludes the low energy ions (residual gas ions and polyatomic ions) from the quadrupole, while analyte ions pass through, as illustrated in Figure 2. The inherent low interference level of the Agilent ICP-MS plasma design means that the ORS can be optimized for effective interference removal without requiring element-specific cell conditions, thereby enabling accurate trace measurements in high matrix samples(2).

(1) The Effects of Cell-gas Impurities and Kinetic Energy Discrimination in an Octopole Collision Cell ICP-MS under Non-thermalized Conditions. Yamada N., Takahashi J. and Sakata K., JAAS - in publication.

(2) Analysis of Diluted Sea-water at the ng/L Level using an ICP-MS with an Octopole Reaction Cell. Leonhard P., Pepelnik R., Prange A., Yamada N. and Yamada T., J. Anal. At. Spectrom., 2002, 17, 189.

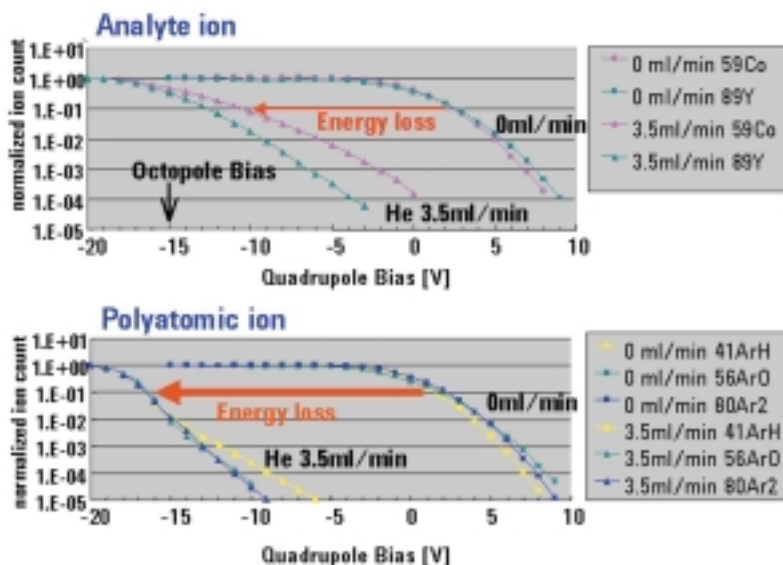
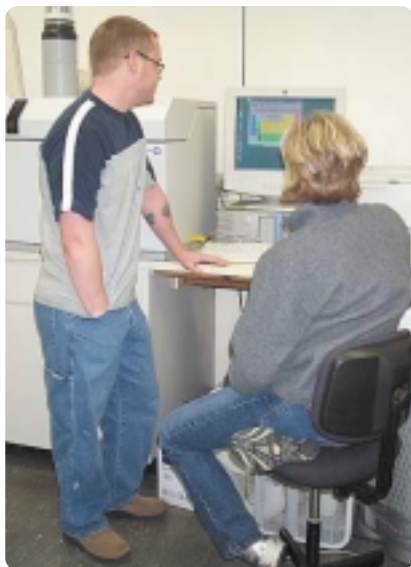


Figure 2. Plots showing ion energy loss, estimated from stopping curve measurements, using He as the collision gas in the ORS.

Energy loss for polyatomic ions is greater than for monatomic ions. The quadrupole bias voltage is selected to discriminate between the low residual energy polyatomic species and the higher residual energy monatomic species. In all cases an octopole bias of -15V was used. Thus the "potential well" between the octopole (cell) and quadrupole (analyzer) prevents the polyatomic species from entering the quadrupole.

## Profile of Laucks Testing Laboratories Inc., Seattle, USA

Kathy Kreps & Patrick A. Strickland  
Laucks Testing Labs, Seattle, USA



Analysts Patrick Strickland and Amber Keller at the 7500c ICP-MS

Laucks Testing Laboratories, Inc. is a full service analytical laboratory located in Seattle, Washington and has always been at the forefront of analytical technology. It was founded in 1908 by Irving F. Laucks to perform assay work on the ore samples coming back from the Yukon Gold rush. During the depression, the chemists kept busy developing glue from soybeans to help hold wood fibers together, which was crucial to the development of plywood.

The laboratory has been through several metamorphoses since that time, including forensic analysis, drug testing for horse racing and import/export testing. It was purchased by the Owens family in the 1950s and entered the environmental market full steam in the 1970s. As a small business, Laucks is currently focused on the environmental market and has developed the infrastructure to support a large volume sample throughput while still producing data of excellent quality and defensible data packages.

When Laucks was looking for a stable, high throughput ICP-MS instrument that could be used for samples containing varying percentages of salt water, they chose the Agilent 7500c ICP-MS. Evaluation of which instrument to purchase included taking some truly "nasty" samples to Bellevue, where Agilent applications expert Emmett Soffey was able to provide very accurate results for all target elements, including arsenic and selenium. These test results, coupled with reconnaissance in the environmental laboratory industry, led Laucks to select the Agilent 7500c to add to their existing instrumentation.

The variety of sample matrices analyzed by Laucks includes soils, sludges, oils, drinking water, wastewater, seawater, plus TCLP and STLC extracted samples. All metals are analyzed by ICP or ICP-MS. The instruments that are currently in use are a PE FIMS 400 (for Hg analysis), a Thermo Jarrell Ash ICAP 61E ICP, a PE Sciex Elan 6100 ICP-MS, and an Agilent 7500c ICP-MS.

Laucks chose the Agilent 7500c ICP-MS for its ability to analyze a variety of sample matrices and its long-term stability. Using Octopole Reaction System (ORS) cell technology, many types of samples can be analyzed in the same analysis run. These samples include soils, sludges, drinking water, wastewater, seawater, and TCLP and STLC extracted samples. In analyzing soils, sludges and wastewater, analyte concentration can be high for many elements. In analyzing drinking water samples, analyte concentration is usually very low for most elements. In analyzing seawater samples, analyte concentration for elements such as Na, Mg, Ca, K and Sr as well as Cl, Br, S and C is very high, but usually most other elements are present in relatively low concentrations. Analyzing a variety of samples like these is problematic when trying to see elements with either high or very low concentrations in sample matrices that may contain high concentrations of interfering elements such as Cl, Br, S and C. Using ORS cell technology, Laucks is able to analyze all of these types of samples at the same time, from drinking water to salt water.

ORS cell technology allows the analyst to eliminate many interferences in

complex sample matrices such as Cl interference on V, Mn, Cr and As by using He as a collision gas. This is very important, specifically when analysing seawater samples, which can contain up to 2000 ppm Cl, after 10 fold dilution. The ORS cell also allows the analyst to reduce Ar interferences on elements such as Ca, K, Fe and Se using H<sub>2</sub> as a reaction gas. These interferences occur for any ICP-MS when Ar is used as a carrier gas.

Using this technology, Laucks has been able to reduce the amount of sample reruns because of unknown matrices, and are able to run over 100 samples per day while looking for over 30 elements. Laucks' staff and management are very pleased with the performance they have seen from their new Agilent 7500c ICP-MS.



## The Role of ICP-MS at NARL, Australia

The National Analytical Reference Laboratory (NARL) is a business unit of the Australian Government Analytical Laboratories (AGAL). NARL was established in 1997 with the overall aims of:

- Providing an infrastructure to ensure that chemical measurements in Australia are of appropriate quality
- Enabling these measurements to be linked with those made elsewhere in the world.

In support of these aims, NARL is involved in the production of reference materials, development of reference methods, running proficiency testing programs and training courses, and participation in international intercomparisons with other National Metrology Institutes.

The NARL Primary Methods Team develops high-accuracy primary methods of analysis for a range of inorganic and organic measurement areas of relevance to Australia. These areas include the determination of food and environmental contaminants, as well as clinical, forensic and industrial measurements. NARL utilises its capabilities for the provision of reference methods for Australia and for the certification of reference materials.

The reference methods developed by NARL are high-accuracy techniques, such as isotope dilution mass spectrometry (IDMS), which are used to provide results traceable directly to the SI with well defined uncertainties. In IDMS, the concentration of analyte in a sample is calculated from the change in isotope amount ratio brought about by the addition of an enriched isotopic analogue of the analyte. NARL employs an exact-matching double IDMS technique in which samples and calibration standards are both spiked with an isotopic analogue such that the ratio of analyte to spike isotope is equal (and normally close to unity) and the instrumental intensities are also equal. Accurate and precise isotope ratios are highly important

HPLC conditions	
Column	Phenomenex "Luna" 5 µm C18(2) 150 x 2 mm and "ACE 3" 3 µm C18 150 x 2.1 mm
Guard column	Optimize Technologies "OPTI-GUARD" 15 x 1 mm C18
Mobile phase	65% acetonitrile, 23% acetic acid, 12% water & 0.05% triethylamine
Flow rate	200 µl per minute
Inject volume	20 µl
Run time	16.5 minutes
Retention time for TBT	8.6 minutes
ICP-MS conditions	
Nebuliser	Glass Expansion "Micromist" 200 µl/minute uptake
Spray chamber	Scott with Peltier cooling to -5°C
RF Power	1600 W
Carrier gas flow rate	0.85 L/min
Scanning mode	Peak hopping
Dwell time	50 ms

Table 1: HPLC-ICP-MS conditions used for analysis of TBT in sediment

and isotope ratio precisions of <0.1% relative standard deviation have been achieved.

An Agilent 7500 ICP-MS and 1100 Series HPLC were installed in the NARL Primary Methods Team in June 2001 to strengthen NARL's high-accuracy analytical capabilities and to extend its capabilities to include metal speciation. The ICP-MS uses high sensitivity options, however it is sometimes fitted with a removable reaction cell. The HPLC-ICP-MS (with the reaction cell removed) was used to develop an IDMS method for the analysis of tributyltin (TBT) in sediment. The method developed involved the spiking of sediment samples with an isotopically labelled TBT solution enriched with <sup>117</sup>Sn (provided by LGC, England) prior to extraction. The spiked samples, calibration standards and blanks were microwave extracted with aqueous acetic acid. HPLC conditions were developed for separation of the organotin species on a C18 column. To limit the effect of the organics in the HPLC effluent, oxygen was blended with the nebuliser gas and the spray chamber was chilled to -5°C. The HPLC-ICP-MS conditions are summarised in Table 1. This method was used in an international intercomparison (CCQM-P18, coordinated by National Research Council, Canada) of TBT analysis in sediment. The intercomparison

involved National Metrology Institutes and international expert speciation laboratories. The NARL result for TBT in the sediment sample was 81.5 ± 5.2 ng/g as tin. This result was within 0.3% of the mean of all 14 reported values.

The octopole reaction system (ORS) for the ICP-MS was purchased for the removal of polyatomic interferences (Agilent 7500c). Such interferences can be overcome by using NARL's high-resolution ICP-MS but this can lead to an increase in measurement uncertainty due to poor precision measurements at higher resolutions. The use of a second independent measurement technique is also useful for confirmation purposes. The Agilent 7500c is currently being used to develop methods for the high accuracy-analysis of Ca, Cu, Cd and Zn in food matrices.

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The supply of and permission to publish this article by AGAL in no way endorses Agilent products over any similar products currently available on the Australian market.

AGAL acknowledges that the primary reference methods developed by NARL using Agilent equipment can be validated/undertaken using equipment which is manufactured by companies other than Agilent and which meets the required technical specifications.

# Simultaneous Separation of 17 Inorganic and Organic Arsenic Species in Marine Biota by LC-ICP-MS

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## Introduction

A wide variety of arsenic species have been found in marine organisms at concentrations much higher than those in seawater. Along with the inorganic forms of arsenic, namely arsenite and arsenate, a number of organic arsenic compounds are found. Depending on the kind of organism, different patterns of arsenic species are observed. Arsenobetaine is the major compound in marine animals whereas arsenosugars and arsenate are dominant in marine algae.

Arsenic speciation can be used for metabolism studies as well as for the evaluation of the toxicity of seafood. In contrast to tin and mercury species, inorganic arsenic is much more toxic than the organic forms of arsenic, which are considered to be only slightly or even non-toxic.

The challenge of arsenic speciation by LC-ICP-MS is based on the nature of arsenic forms: they differ in charge, molecule size and functional organic groups. Until recently, a complete characterization of a sample was only possible by running a combination of different chromatographic separations. With the method presented here, a separation of at least 17 species was achieved during a single chromatographic run on an anion-exchange column, using a nitric acid gradient and an ion-pairing reagent.

## Experimental

A Dionex 300 chromatograph coupled to an Agilent 7500s ICP-MS was used throughout the study. Different marine organisms - namely fish, bivalves and algae - were analyzed to represent the

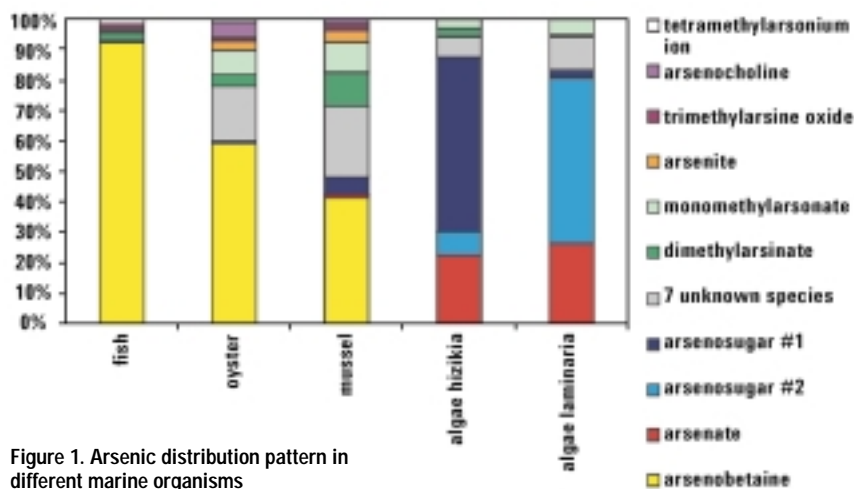


Figure 1. Arsenic distribution pattern in different marine organisms

variety of arsenic species determinable with this method. See Figure 1.

The species were extracted from the biological matrix by means of a methanol/water mixture (3:1) and a dispersion unit within a few minutes. The extract was filtered and diluted prior to injection into the chromatography system.

The ion-chromatograph, consisting of a gradient pump, a Rheodyne injection valve, capillary PEEK-tubing and a 200  $\mu$ L injection loop, was connected to an anion-exchange column and coupled to the ICP-MS instrument, equipped with a quartz concentric nebulizer and a Scott-type glass spray chamber.

The separation was performed using a nitric acid gradient between pH 3.4 and pH 1.8. Benzene-1,2-disulfonic acid dipotassium salt was added as an ion-pairing reagent.

Quantitation of the arsenic content of each species was based on an external three-point-calibration with the arsenic species available (evaluation by peak area).

The concentration of the tetramethylarsonium-ion and the arsenosugars were evaluated by applying the calibration equation of arsenocholine and dimethylarsinic acid.

## Conclusions

This reliable and stable LC-ICP-MS method provides a clear overview of all major and minor arsenic compounds in different marine organisms in one chromatogram, including a clear separation of the

toxic species from the less- and non-toxic compounds. Qualitative representation can be found in the retention time and quantitative representation in the peak area. Comparison of different samples for metabolism studies and toxicity evaluation becomes much easier. In addition, low detection limits were achieved, especially for the toxic arsenite, the most critical compound in seafood. Spiking experiments revealed that the retention times of the compounds were constant in the different biological matrices, so that even unknown species could be directly compared in the marine organisms. The resolution of the separation proved to be very successful and, as a result, the risk of errors due to co-eluting peaks is negligible. A confirmation of the compound purity will be achieved by coupling the chromatograph to an ESI-MS/MS system. Coupling to an ESI-MS/MS is also essential to characterize the numerous arsenosugars, which could not be identified in this work because standard solutions are difficult to obtain.

# Trace Metals in Pentane with the Agilent 7500c

**Emmett Soffey**  
Agilent Technologies, USA

Trace metals were determined in pentane using the Agilent 7500c. Direct analysis precludes the use of more labor intensive and contamination prone techniques such as dry ashing, digestion and dilution.

## Instrumentation

The 7500c Octopole Reaction System (ORS) was equipped with an optional flow module for the addition of oxygen to the plasma. The sample introduction system consisted of a PFA-20 low flow concentric nebulizer (Elemental Scientific Inc.), quartz spray chamber, quartz torch and platinum sample and skimmer cones. Sample uptake was accomplished by self-aspiration. The low flow nebulizer allowed for the direct aspiration of naphtha. Volatile solvents may extinguish the plasma if the rate of aspiration is too high.

## Sample Preparation

Semiconductor grade pentane was obtained from Alpha Aesar. Intermediate stock solutions were prepared in Conostan base 20 oil. These solutions were then diluted with pentane. All of the standards were prepared gravimetrically.

## Results and Discussion

The 7500c was optimized for sensitivity and interference removal using the built-in software routines. It was not necessary to tune on an element basis or even in the different sample matrices (naphtha and xylene were studied at the same time), as the interference removal performance of the ORS is not matrix-specific. Representative data for pentane is shown in Figure 1. The calibration curves demonstrate the effectiveness of the 7500c for the determination of Hg, Se and As at very low levels in pentane.

Further data for naphtha, xylene and pentane, will be given in a future application note.

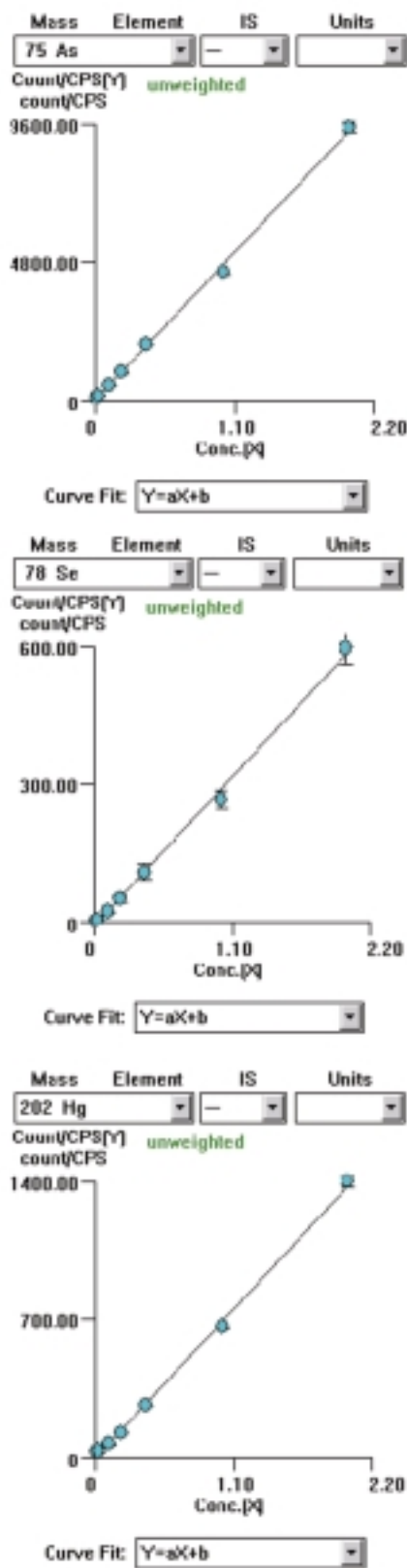


Figure 1. Calibration curves for As, Se and Hg in pentane using the 7500c (Units: ppb).

# Enhanced Multi-tune Functionality

**Tomo Yamada**  
Tokyo Analytical Division, Agilent Technologies, Inc. Japan

Multi-tune is one of the most powerful functions of the Agilent 7500 ChemStation software (Windows 2000 version). For example on the Agilent 7500c collision/reaction cell ICP-MS system, Multi tune facilitates automatic switching of several operating modes, such as hydrogen, helium and non-gas (normal) mode, in one analytical run. Now, with the release of Rev.B.01.03 of G1834B, the same element/mass can be selected for analysis using several operating modes. This enhanced functionality expands the method flexibility so that the same internal standards or analyte ions can be observed in multiple modes thus aiding method development and optimization. For unknown matrices, critical isotopes can be measured in all three modes and the best mode selected for reporting after acquisition.

A free upgrade to Rev.B.01.03 of G1834B is available for Windows 2000 ChemStation customers. The upgrade can be downloaded from Agilent's ICP-MS support website

1. Visit [www.agilent.com/chem/icpms](http://www.agilent.com/chem/icpms)
2. Select "Technical Support" from the left hand panel.
3. Select "Software Status Bulletins & Patches". (You will need to enter the 10 digit registration number shown on the "Software Certificate and Registration Packet" supplied with your instrument)
4. Click on "ICP-MS ChemStation"
5. To download the file for your ChemStation, click on "Agilent 7500 ICP-MS ChemStation G1834B for Windows 2000 Patch File" and follow the instructions given.

If your Agilent 7500 runs on Windows NT, you will need to upgrade your ChemStation to the Windows 2000 version first. Please contact your local Agilent representative about this upgrade.



## Successful Agilent ICP-MS User Meetings

### First UK Meeting



The first ICP-MS User Meeting to be held in the UK took place at South East Water, Frimley Green, near London on May 9th 2002. The 20 users attending were joined by eight Agilent specialists, including special guest Steve Wilbur from the US.

Special thanks to Agilent's Paul Stephens (UK Environmental Specialist) and Ed McCurdy for the organization. User speakers were Howard Handley (SE Water), Tim Down (STL Bridgend) and Rai Wahlen (LGC). During his presentation on support, Agilent's Glenn Carey asked the audience for any instrument/support problems they had, and none were reported - great job by Glenn and the UK support team!

The most notable comment came from STL Bridgend lab manager Tim Down- his 2x 7500i systems are now performing the metals analysis on the drinking water supplied to 20% of the UK population - about 10 million people! In numbers of samples this is 15,000 samples/month through the 2 instruments! And he hasn't even had time to set up the ISIS yet!

### Second Australian Meeting



The Second ICP-MS User Meeting in Australia took place between 1st and 3rd July 2002 in Brisbane,

Queensland, Australia. The meeting was hosted by Rod Francis of QHSS who helped to organize the facilities. Fred Fryer, the ICP-MS applications engineer in Australia, was the chairperson throughout the proceedings, which included presentations by users and members of the Asia Pacific ICP-MS team, as well as an excellent afternoon cruise and barbeque on Monday.

The group of 18 users and 6 Agilent staff included veterans as well as some new faces, and provided a useful forum for the swapping of ideas and operating tips.

Special thanks are owing to Yu Zhong Shu (Murdoch); David Hill (ANSTO); Richard Myers (NARL); Bernie Zarchinas (CSIRO); Henri Wong (ANSTO); Charlotte Allen (ANU); Matthew Baxter (Sullivan & Nicolaidis) and Amjad Shraim (QHSS) for their excellent contributions.

Feedback from everyone was positive and all are looking forward to next year's event.

### World Wide ICP-MS User Meeting

Agilent will be hosting a User Meeting for all Agilent ICP-MS users attending the European Winter Conference on Plasma Spectrochemistry in Garmish-Partenkirchen, Germany. The date for your diary is 15th January 2003 starting at 18:30. Check out the web site at [www.agilent.com/chem/icpms](http://www.agilent.com/chem/icpms) for further details.

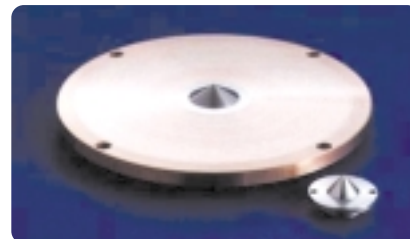
### Plasma Award Winner Announced

Congratulations to Prof. Dr. Detlef Guenther, of ETH Zurich, Switzerland, who is the winner of the First European Plasma Award for Spectrochemistry, sponsored by Agilent Technologies. Prof. Guenther will receive his award at the 2003 Winter Plasma Conference. A full story, including an interview with Prof Guenther, will feature in the next issue of the Journal.



## Tips & Tricks

### Citranox - the solution for a "kinder, gentler" cone cleaning



Common laboratory cleaner Citranox provides a gentle and effective approach to ICP-MS cone cleaning. Simply sonicate the cones in a 10% solution of Citranox for 30 minutes or until obviously clean. Gently wipe with a soft cloth, rinse in clean water and re-sonicate in DI water for a few minutes to remove residual Citranox. Rinse thoroughly in DI water and air dry or blow dry with clean argon or nitrogen and reinstall. Since Citranox is not strongly acidic, it does not dissolve or etch the cone surfaces or orifices consequently cones stay cleaner longer and last longer too. The same process also works well for ICP-MS glassware. Be careful though, sonication may cause some glassware to break. Simply heating the glassware in 10% Citranox works well as a substitute to sonication. Citranox is manufactured by Alcanox Inc. USA, [www.alcanox.com](http://www.alcanox.com) and is available from most laboratory supplies vendors.

We hope to make "Tip & Tricks" a regular feature in the Journal. If you have a Tip to share with other users, please send them to: [steve\\_wilbur@agilent.com](mailto:steve_wilbur@agilent.com)

## On-line Environmental ICP- MS Customer Survey

While ICP-MS has rapidly become the de facto standard for the analysis of trace metals in environmental samples, continuing advancements in instrument technology and hyphenated techniques promise to carry the technique into completely new areas of analytical chemistry. These advances include improvements in matrix tolerance, sensitivity, dynamic range and reduction of interferences. They include tightly integrated separation techniques such as LC, GC, CE and others. They also include advances in intelligent automation, ease of use and ease of maintenance. With all these possibilities, it is important for us to understand your needs as our customers. To help in this understanding, we have created a simple customer survey designed to tell us what are the current and future needs of our Environmental ICP-MS customers. By answering a few multiple-choice questions telling us specifically what you want from us, you could win a superb digital camera. To influence the direction of ICP-MS instrumentation of the future, visit [www.agilent.com/chem/icpms](http://www.agilent.com/chem/icpms)

## Events

### FACSS

October 13 - 17, 2002  
Providence, Rhode Island, USA

### Expoquimica

Nov 26 - 30, 2002  
Madrid, Spain

### European Winter Conference on Plasma Spectrochemistry

12-17 Jan, 2003  
Garmisch-Partenkirchen  
Germany  
[www.gdch.de/tagung/5545/index.htm](http://www.gdch.de/tagung/5545/index.htm)

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## New Members of the Agilent ICP-MS Club

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

- Griffith University, Australia
- M.G.T. Environmental Consulting P/L, Australia
- WSL Consultants Pty Ltd, Australia
- Indian & Northern Affairs, Canada
- Guangzhou Analytical Centre, China
- Guanngdong CIQ, China
- ECB-Online, Germany
- Neckar Westheim 2, Germany
- VAW Aluminium AG, Germany
- Enichem, Italy
- University of Venice, Italy
- DMWW, Korea
- Seoul University, Korea
- Nagase Chemical, Singapore
- Stella Chemifa, Singapore
- Vanguard International Semiconductor Cor, Taiwan
- BASF, USA
- ERMI Environmental Lab, USA
- GEO Analytical Laboratories Inc., USA
- Las Vegas Valley Water District, USA
- Laucks Testing Laboratories Inc, USA
- Neilson Research, USA
- Suffolk County Water Authority, USA
- Trichemical Systems, USA
- University of Idaho, USA
- USDA FSIS Eastern Lab, USA
- Nagase Chemical, Vietnam

## ICP-MS User Forum Takes Off!

With more and more users joining the Forum each day, membership is growing steadily, and more user postings are beginning to appear. Thanks to all of you who have registered so far. Questions on a range of topics from requests for hints on the analysis of phosphorus to advice on calculating instrument error have been covered. To see what has already been posted, to pose new questions, or to share information with fellow users, click on the Forum link from [www.agilent.com/chem/icpms](http://www.agilent.com/chem/icpms)



## Recent Agilent ICP-MS Publications

To view and download these latest publications, go to [www.agilent.com/chem/icpms](http://www.agilent.com/chem/icpms) and look under "Key Information".

Title	Publication. No.
<a href="#">A Comparison of GC-ICP-MS and HPLC-ICP-MS for the Analysis of Organotin Compounds</a>	5988-6697EN
<a href="#">Extending the Dynamic Range of Environmental ICP-MS Using the Integrated Sample Introduction System and Octopole Reaction System</a>	5988-6628EN
<a href="#">Direct Analysis of Photoresist by ICP-MS</a>	5988-7100EN
<a href="#">Techniques for the Analysis of Organic Chemicals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)</a>	5988-6190EN
<a href="#">Using Lead Isotope Ratios to Distinguish Between Samples of the Traditional Chinese Medicine Dan-shen</a>	5988-7450EN
<a href="#">Analysis of Rare Earth Elements in Geological Samples by Laser Ablation - Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS)</a>	5988-6305EN
<a href="#">Integrating the Agilent 7500 ICP-MS into a Laboratory Information Management System</a>	5988-7025EN
<a href="#">Discover the Full Capabilities of ICP-MS in Food Safety (Tech Feature)</a>	5988-6795EN
<a href="#">Measuring Ultratrace Levels of Metals in HF and H2O2 by ICP-MS (Tech Feature)</a>	5988-6698EN
<a href="#">New Applications of GC-ICP-MS (Poster)</a>	5988-7243EN
<a href="#">Plus: Autodilution with Integrated Sample Introduction System (ISIS) (Tech Manual)</a>	5988-7537EN
<a href="#">A practical guide for ISIS users.</a>	



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