Agilent ICP-MS Journal

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Agilent Technologies

Direct Analysis of Seawater using the 7800 ICP-MS with HMI for Aerosol Dilution

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Introduction

The Environment Agency (EA) is responsible for safeguarding the natural environment of England. The Agency also has a duty to manage and protect surface waters and groundwaters, including water sources used for drinking water abstraction and aquaculture. This task involves the analysis of many varying water matrices.

Some of the most challenging work undertaken in the EA laboratories is the determination of potentially toxic trace metals in saline and estuarine waters. This analysis helps to ensure the safety of seafood derived from coastal and estuarine fishing and shell fisheries. The analysis is difficult for various reasons:
• The high and variable levels of total dissolved solids (TDS) in solution.
• The potential spectral interferences that arise from the matrix.
• The low detection limits that must be routinely achieved while operating at high sample throughput.

Among the elements of interest are Ni, Cu, Zn, Cd and Pb, with required minimum reporting values of 0.3, 0.2, 0.4, 0.03 and 0.04 µg/L, respectively.

The existing method used for this application at the EA Starcross laboratory employs a suspended iminodiacetate reagent to perform the dual role of matrix elimination and analyte preconcentration, followed by analysis using ICP-MS. The method achieves the required performance, but the sample preparation stage requires expensive reagents, is time consuming, labor intensive, and needs to be carried out by a skilled analyst.

With the goal of simplifying the analysis, EA evaluated the Agilent 7800 ICP-MS. The objective was to develop a robust and reliable method capable of directly analyzing saline and estuarine water samples, without requiring matrix elimination, preconcentration, or sample dilution before analysis. Improved efficiency had to be achieved without compromising data quality or degrading productivity.

Experimental

Instrumentation

An Agilent 7800 ICP-MS with the standard High Matrix Introduction (HMI) system and optional Agilent Integrated Sample Introduction System (ISIS 3) was used for the analysis. Sampling was performed by the Agilent SPS 4 autosampler.

The ICP-MS was configured with the standard sample introduction system consisting of a Micromist concentric nebulizer, quartz spray chamber, and quartz torch with 2.5 mm id injector. The Agilent argon gas humidifier was also fitted to the carrier gas to prevent salt build-up on the nebulizer. Internal standards (Rh, Ir) were added online at a 1:1 ratio using 0.76 mm id tubing for both the ISTD and carrier/sample streams.

Instrument operating conditions are listed in Table 1. The settings for HMI were autotuned based on the expected matrix level for the samples of interest. The target analytes (Ni, Cu, Zn, Cd, and Pb) were all acquired in helium (He) collision mode. Employing a simple, single-tune step method, He mode reliably reduces or eliminates all common polyatomic interferences using kinetic energy discrimination (KED).

Table 1. 7800 ICP-MS operating parameters.

Parameter	Value
RF power (W)	1600
Sampling depth (mm)	10
Carrier gas (L/min)	0.68
Dilution gas (L/min)	0.27
Helium cell gas (mL/min)	5.0
Energy discrimination (V)	5
ISIS 3 loop size (uL)	300

HMI conditions (shaded parameters) were automatically optimized during startup.

Reagents and samples

Trace element free seawater was prepared by complexation on iminodiacetate functionalized polymer microbeads (CETAC). The seawater was then used to prepare calibration, QC, and matrix blank solutions. All solutions were prepared at the EA Starcross laboratory. The ISIS 3 carrier solution was 2% HNO_3/0.5% HCl (UpA Merck).

New ICP-MS method and workflow

In evaluating the new ICP-MS method, various seawater samples were analyzed. The 7800's HMI system uses "aerosol dilution" to reduce the matrix loading on the ICP-MS. This technology allows the direct introduction of high matrix samples such as seawater. As sample throughput was also an important factor, the 7800 was fitted with an ISIS 3 loop injection system. ISIS 3 injects a discrete volume or "plug" of the sample into a flowing carrier stream, allowing sample run times to be reduced to approximately 1 minute. ISIS 3 also further improves matrix tolerance by minimizing the period that the ICP-MS instrument's sample introduction, plasma, and interface are exposed to the sample matrix during each measurement.

A range of matrix-based polyatomic interferences can hinder the measurement of many analytes when analyzing saline waters by ICP-MS. For example: $^{44}Ca^{16}O$ on ^{60}Ni; $^{23}Na^{40}Ar$ on ^{63}Cu; $^{95}Mo^{16}O$ on ^{111}Cd. To provide effective attenuation of these polyatomic ions, the 7800 includes an ORS^4 cell that is optimized for operation in helium (He) collision mode. He mode provides the simplicity of a single tune-step method, and delivers reliable and accurate quantitation of a wide range of elements. In addition to reducing method complexity, the use of He mode eliminates the element-by-element and sample-by-sample optimization that is often required in quadrupole ICP-MS methods that use reactive cell gases.

The 7800 – including HMI settings and ISIS 3 program – is fully controlled by Agilent ICP-MS MassHunter software. MassHunter also provides simple, consistent autotuning and automated method setup using the MassHunter Method Wizard.

Results and discussion

Several seawater matrices were tested including: Quasimeme interlaboratory performance test samples (estuarine and open ocean); an EA in-house AQC; natural open ocean and estuarine water samples; and spikes of each natural sample. All these varied sample matrices were measured (n=4) in random order, regardless of salinity, against a single multi-element calibration set. The blank seawater was also repeated

randomly throughout the run (n=40) to determine method detection limits (MDLs). The internal DLs (3σ the calibration blank; n=3) and external MDLs are shown in Table 2.

Table 2. DLs and MDLs

Element	DL, µg/L	MDL, µg/L
^{60}Ni	0.013	0.036
^{63}Cu	0.0096	0.055
^{66}Zn	0.049	0.22
^{111}Cd	0.0038	0.011
^{208}Pb	0.013	0.022

Analytical results for seawater samples

The results for the various seawater samples are given in Table 3. The mean results are in good agreement with the expected or assigned values where provided. Good agreement was also achieved between the mean results obtained using the 7800 and the results obtained at EA Starcross laboratory. The Starcross results were obtained using the existing ICP-MS method following matrix elimination and preconcentration of the samples. Using the new 7800 direct analysis method, excellent spike recoveries were achieved for all five elements in the spiked seawater and estuarine samples.

Conclusions

The Agilent 7800 ICP-MS with HMI can be used to directly analyze samples with matrix levels over 10x above the normal 0.2% dissolved solids limit commonly accepted for ICP-MS. The 7800 system, when combined with ISIS 3 for loop injection, provides a routine method for analyzing large batches of varied saline water samples.

This configuration provides a rapid and simple means of measuring ultratrace elemental concentrations in saline samples without requiring advanced sample preparation methodologies or complex, multi-tune reaction cell methods. Using a simple, automated dilution in the aerosol phase also reduces the potential for contamination from sample preparation reagents, or errors due to liquid dilution equipment or related sample handling steps.

The overall sample analysis time is significantly shortened due to the simplification of the sample preparation stage, and the rapid throughput of ISIS 3 loop injection.

The method proved to be fit-for-purpose for the routine, direct measurement of seawater samples in a high-sample throughput lab environment.

Further Information

See Agilent application note:
High Throughput, Direct Analysis of Seawater using the Agilent 7800 ICP-MS with HMI for Aerosol Dilution, **5991-7936EN**.

Table 3. Mean concentrations (µg/L) of the randomized four repeat measurements for each sample, including comparison with the data acquired at the EA Starcross laboratory, where appropriate.

Analyte		^{60}Ni	^{63}Cu	^{66}Zn	^{111}Cd	^{208}Pb
AQC	Mean	2.44	2.00	4.19	0.202	0.410
	Expected	2.50	2.00	4.00	0.200	0.400
Quasimeme Estuarine	Mean	1.22	5.19	15.54	0.271	1.62
	*Starcross	1.17	4.95	15.00	0.270	1.41
	Assigned	1.14	4.83	14.80	0.260	1.51
Quasimeme Saline	Mean	1.19	10.78	22.09	0.101	0.418
	*Starcross	1.14	10.40	21.10	0.095	0.380
	Assigned	1.04	10.00	20.70	0.098	0.410
Saline	Mean	1.13	0.91	2.52	0.021	0.081
Saline Spike	Mean	8.21	8.09	39.01	0.732	3.64
	Recovery, %	101.13	102.55	104.27	101.65	101.79
Estuarine	Mean	0.73	1.87	1.17	0.02	0.02
Estuarine Spike	Mean	7.78	9.02	36.64	0.716	3.52
	Recovery, %	100.66	102.13	101.33	99.56	99.82
Standard 4	Mean	10.20	10.21	51.29	1.03	5.08
	Expected	10.00	10.00	50.00	1.00	5.00

Ultrasensitive High Throughput Elemental Speciation Analysis using GC-ICP-MS

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Figure 1. Calibration curve for tributyltin from 0 to 100 ng/L (ppt)

GALAB is an independent service laboratory that analyzes and evaluates contaminant elements and compounds in food, food packaging, sanitary products, industrial products, biopharmaceutical products, and environmental samples. We are well-equipped with the latest analytical equipment, and use a broad range of standard and tailored analytical methods to provide our clients with high-quality data. Our analytical database comprises more than 5000 single substances and more than 1000 different analytical methods. Despite this range, we are constantly developing new methods on behalf of our clients to ensure the quality and safety of their products.

Speciation of organotin compounds

Organometallic species may occur naturally in the environment or be present as a result of human activity [1]. Organometallic compounds are often more bioavailable and toxic than inorganic compounds of the same element. This is especially true for organotin compounds (OTCs), such as tributyltin (TBT) and triphenyltin (TPhT). Trisubstituted OTCs are extensively used as biocides in agrochemicals, antifouling paints, wood preservatives and for material protection. Mono-alkyl and dialkyl tin compounds are widely used as PVC stabilizers in packaging and coating materials, foils, and various types of piping [2]. Both TBT and TPhT are well-known endocrine disruptors that have contaminated the environment for more than 50 years [3]. The biological effects of OTCs on organisms depend on both the nature and number of organic groups bound to the Sn(IV) cation, with the highest level of toxicity being exhibited by the trisubstituted compounds like TBT [4].

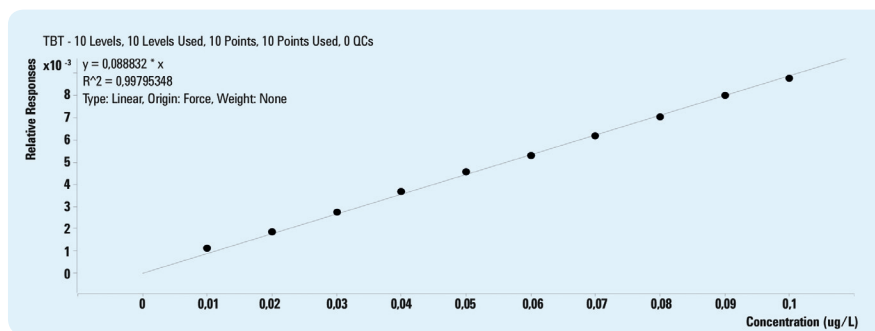There is a trend towards more stringent environmental regulations, with tighter control of potential contaminants. Actual or expected changes to the regulatory framework create a demand for more sensitive and robust analytical procedures. In this article, a sensitive, high-throughput technique is presented for the detection of organometallic species in different matrices.

Currently, most laboratories use GC with MSD, FPD, or AED for the detection of organometallic compounds. None of these techniques offers the required sensitivity, stability, or robustness to meet evolving environmental requirements. However, ultrasensitive high throughput elemental speciation analysis (UHTESA) is now possible using GC-ICP-MS with a suitable sample preparation technique [5].

Experimental

Reagents and samples

Analytical grade reagents were bought from Merck, Germany, and were used without further purification. Single compound and mixed organo-tin standards were obtained from Campro Scientific, Germany. Sodium tetraethylborate was from Synthese Nord, Germany.

Instrumentation

An Agilent 7890 GC was coupled to an Agilent 7900 ICP-MS using the Agilent GC-ICP-MS interface (G3158D). The GC was fitted with an Agilent J&W DB-5ms Ultra Inert column. The ICP-MS was fitted with platinum-tipped interface cones.

Table 1. GC-ICP-MS operating parameters

Parameter	Value
RF power (W)	1100
Injection port temperature (°C)	280
Helium carrier gas flow rate (mL/min)	19.6
Injection volume (µL)	1

Table 2. GC temperature program

Start temp (°C)	50
Heating rate (°C/min)	40
Max temp (°C)	320
Hold time (min)	3

Appropriate sample preparation (extraction and derivatization) techniques are an important prerequisite to the accurate determination of organometallic species by GC. The species must be transformed into their peralkylated nonpolar derivatives. A detailed description of the sample preparation steps is given in reference [1].
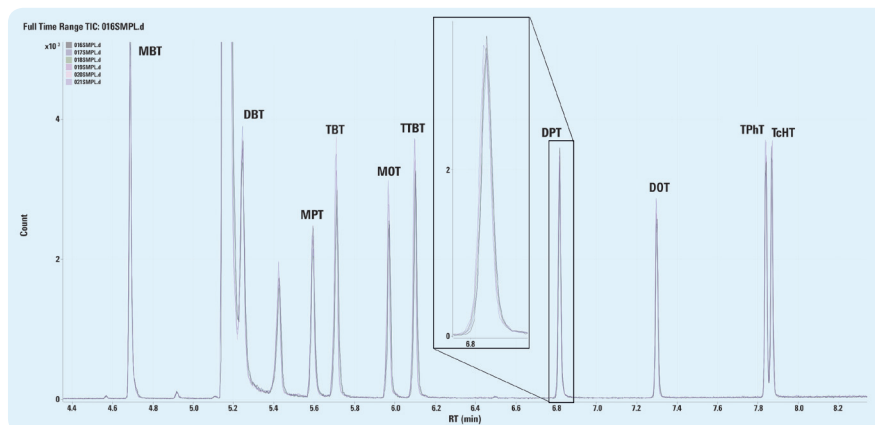

Figure 2. Six injections of a standard containing 10 organotin species at 1.0 µg/L (ppb)

Results and discussion
Calibration
A calibration curve was generated by measuring Sn in the TBT calibration standard solutions as shown in Figure 1. The limit of detection (LOD) and limit of quantification (LOQ) obtained for TBT, calculated according to the method defined in DIN 32645, were 2 ng/L (ppt) and 7 ng/L respectively.

Excellent precision was achieved from six injections of a standard containing 10 organotin species at 1.0 µg/L, as shown in Figure 2.
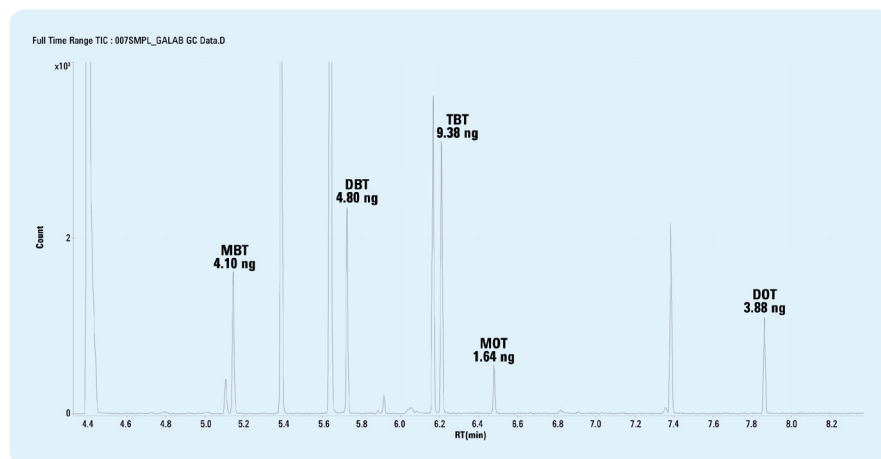
Analytical results for real samples
A slightly modified version of the method, using a 1 minute hold of the start temperature, has been implemented for routine analysis of OTCs in several sample types. The chromatogram in Figure 3 shows tin species present in a sediment. The results in Table 4 show the different distributions of tin species in samples of drinking water, surface water, sediment, fish, and a PVC children's toy.

Surface water surveillance directives
In 2000, Directive 2000/60/EC of the European Parliament and of the Council was adopted. This EU Water Framework Directive sets out the objectives for Community action in the field of water policy and defines a strategy to reduce water pollution. The strategy involves the identification of priority substances among those substances that pose a significant risk to, or via, the aquatic environment at European Union level. Decision No 2455/2001/EC established a list of 33 substances or groups of substances that were prioritized at EU level for inclusion in Annex X to Directive 2000/60/EC [6]. Directive 2013/39/EU specifies an annual average content for tributyltin of 0.2 ng/L in surface water.

Conclusions
The GC-ICP-MS method is robust, reproducible, and highly sensitive. It meets the requirements of current legislation, including the low specifications for tributyltin specified in Germany's WRRL (2013/39/EW) framework for surface water surveillance monitoring of 0.2 ng/L.

The method is suitable for a wide variety of sample matrices, but sample preparation remains the most challenging step.

Currently, in our labs at GALAB, we routinely use GC-ICP-MS to measure OTCs in 300–400 samples every month. Typical sample types include food and infant food, animal feed, beverages, consumer products, plus many types of environmental samples.

Figure 3. GC-ICP-MS chromatogram of a sediment sample showing OTCs from leachate contamination

Table 3. Concentration of OTCs in various sample types

OTC	RT, min	Sample and concentration				
		Drinking water, ng/L	Surface water, ng/L	Sediment, µg/kg	Fish, µg/kg	PVC toy, µg/kg
Monobutyltin (MBT)	5.13	0.07	1.66	4.1	0.35	14.01
Dibutyltin (DBT)	5.71	0.06	0.75	4.8	0.71	55.04
Monophenyltin (MPT)	6.03	<0.01	0.16	<0.1	<0.01	<1
Tributyltin (TBT)	6.22	<0.01	1.05	9.38	0.05	3.16
Monooctyltin (MOT)	6.49	0.01	0.15	1.64	0.04	<1
Tetrabutyltin (TTBT)	6.53	<0.01	<0.01	<0.1	<0.01	<1
Dioctyltin (DOT)	7.74	<0.01	0.015	3.88	0.01	<1
Triphenyltin (TPhT)	8.31	<0.01	0.07	<0.1	0.07	<1
Tricyclohexyltin (TcHT)	8.35	<0.01	<0.01	<0.1	<0.01	<1

Internal standards: tripropyltin (TPT), tetrapropyltin (TTPT), monoheptyltin (MHT), and diheptyltin (DHT)

References
1. E. Jantzen et al. Fresenius J Anal Chem (1995) 353, 28–33
2. R. Airaksinnen et al. Environ Research (2010) 110, 544–547
3. A. Prange, E. Jantzen, J Anal At Spectrom (1995) 10, 105–109
4. J. B. Graceli et al. Reproductive Toxicology (2013) 36, 40–52
5. E. Jantzen et. al. J. of Chrom. A (2017), in press.
6. Directive 2013/39/EU of the European Parliament and of the Council, http://eur-lex.europa.eu/homepage.html

An Overview of the Role of ICP-QQQ at Ghent University

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The Atomic and Mass Spectrometry (A&MS) group at Ghent University, Belgium, specializes in the development of methods for the determination, speciation and isotopic analysis of metals and metalloids, using ICP-MS to solve analytical challenges across different disciplines.

Since taking delivery of its first ICP-MS instrument in 1987, the A&MS research unit has established an international reputation as a leading authority on ICP-MS instrumentation, methodology and applications.

Managed by Professor Frank Vanhaecke, the unit is well equipped with ICP-MS instrumentation including 3 quadrupole ICP-MS instruments; a sector field high-resolution instrument; a multi-collector sector field ICP-MS; and, since 2013, an Agilent 8800 Triple Quadrupole ICP-MS.

Methyl fluoride reaction cell gas

During a recent webinar presented by Prof. Vanhaecke, examples were presented which illustrate the excellent results obtained using methyl fluoride (a mixture of 10% CH_3F and 90% of He) as a very versatile collision/reaction cell (CRC) gas for ICP-MS/MS.

One example was the determination of arsenic and selenium in environmental samples using a mass-shift method. In samples containing chlorine, the polyatomic ions $ArCl^+$ and $CaCl^+$ cause spectral overlap at m/z 75, affecting the only isotope of arsenic, ^{75}As. However, As^+ ions react with methyl fluoride cell gas, forming $AsCH_2^+$ product ions at m/z 89, while $ArCl^+$ and $CaCl^+$ do not react, so remain at m/z 75. As a result, As can be resolved from the polyatomic overlaps, giving detection limits below 1 ng/L (ppt). Using MS/MS, any potential overlaps on the $AsCH_2^+$ product ions at m/z 89 are also removed, as Q1 is set to m/z 75.

All of selenium's analytically useful isotopes can suffer from spectral interferences arising from polyatomic ions, such as $ArCl^+$, $CaCl^+$ $ArAr^+$, $ArCa^+$, $CaCa^+$. Again, CH_3F selectively reacts with the Se^+ ions in the CRC, shifting Se away from the polyatomic overlaps. Using this approach, Se can be measured at detection limits below 10 ng/L (ppt).

Representative results for the determination of As in seven certified reference materials are given in Table 1. In all cases, agreement between the measured and certified values was excellent. Similar data for Se (^{77}Se, ^{78}Se and ^{80}Se) can be found in the webinar Executive Summary article.

Table 1. Determination of As in CRMs using ICP-MS/MS.

Reference material	Measured, ug/g	Certified, ug/g
NIST SRM 1575 Pine needles	0.24 ± 0.01	0.21 ± 0.04
NBS SRM 1573 Tomato leaves	0.31 ± 0.01	0.27 ± 0.05
NIST SRM 1568a Rice flour	0.28 ± 0.01	0.29 ± 0.03
BCR CRM 526 Tuna fish tissue	4.95 ± 0.07	4.80 ± 0.30
NRC DORM-4 Fish protein	6.69 ± 0.06	6.80 ± 0.64
BCR CRM 414 Plankton	6.90 ± 0.13	6.82 ± 0.28
NIST SRM 1646 Estuarine sediment	10.59 ± 0.28	11.60 ± 1.30

The A&MS group also used CH_3F cell gas for strontium 87/86 isotopic analysis using Laser Ablation (LA-) ICP-QQQ. The $^{87}Sr/^{86}Sr$ ratio is useful for identifying the origin of materials such as foodstuffs, fish stocks; archaeological and forensic sample analysis; and Rb/Sr dating of rocks.

The challenge in this application is to overcome the isobaric interference of Rb-87 on Sr-87 – which isn't even possible using high resolution ICP-MS.

Using ICP-QQQ and CH_3F cell gas, the Sr 86 and 87 ions react to form SrF^+ product ions at m/z 105 and 106, respectively. Because Rb^+ ions do not react in the same way with CH_3F, the isobaric overlap from ^{87}Rb on ^{87}Sr is eliminated, allowing the $^{87}Sr/^{86}Sr$ ratio to be determined accurately. Reference materials with increasing relative concentrations of rubidium were analyzed using the LA-ICP-QQQ method calibrated using NIST SRM 610 glass. The measured Sr isotope ratio results were in excellent agreement with the reference values, even in the samples with the highest concentration of Rb. The Sr IR measurement precision was typically 0.05% RSD or better.

Executive Summary: ICP-MS/MS: Much More Than A High Performance Quadrupole ICP-MS

To complement the recent webinar: **ICP-MS/MS: Much More than Just a High Performance Quadrupole ICP-MS** presented by Professor Frank Vanhaecke of Ghent University, Spectroscopy has produced a free, open-access summary article.

Published on January 05, 2017, the 6-page document includes a brief account of the evolution of ICP-MS approaches to overcome spectral interferences, leading to the release of the first tandem ICP-MS (ICP-MS/MS) in 2012. The general principles of the technique are discussed followed by examples to illustrate the benefits of ICP-MS/MS for a variety of applications including:

- Determination of ultra-trace metals including Ti in biological materials
- Determination of As and Se in environmental samples
- Strontium isotopic analysis using Laser Ablation ICP-QQQ

You can access the Executive Summary at: **http://www.spectroscopyonline. com/icp-msms-much-more-just-high-performance-single-quadrupole-icp-ms**

You can also still view the webinar recording by clicking on the "Webcasts" tab at **www.spectroscopyonline.com**

Agilent Mentors Young Scientists at European Winter Plasma Conference 2017

Isabel Cuesta

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Around 500 participants from 40 countries traveled to the Austrian alps in February for the biennial European Winter Conference on Plasma Spectrochemistry (EWCPS).

The five day conference remains the premier meeting in the field of plasma spectrochemistry as it brings together a mix of scientists from different disciplines to share ideas. This year, the scientific program consisted of over 160 high-quality oral presentations and over 190 posters. Lively discussions were also continued in the exhibition and social areas.

Agilent had the pleasure of welcoming a high number of visitors to its exhibition stand. Under the banner: **Over 30 years enabling technologies for emerging talents**, Agilent celebrated two important themes. Recognition of its ongoing involvement in many of the significant developments of ICP-MS since 1987, with a focus on recent advancements including:

- Unrivalled expertise in ICP-QQQ technology, gained since the introduction of the first ICP-QQQ in 2012.
- Release of the second generation 8900 ICP-QQQ in 2016, reinforcing Agilent's commitment to helping its customers solve more difficult analytical challenges.

Equally important is the company's commitment to supporting young scientists as they set out on their careers in atomic spectroscopy. Four of Agilent's spectroscopists, Jenny Nelson, Nahid Chalyavi, Sebastien Sannac, and Alain Desprez, held one-to-one talks with the young researchers during an Agilent Career Table event. They shared useful information on their work experience and opportunities to work in a top-rated company, such as Agilent. blog.indeed.com/2016/05/05/fortune-500-top-companies-to-work-for/

Plasma Award winner Joanna Szpunar with Agilent's Sayuri Otaki

Jerome Darrouzes, European Business Manager for Atomic Spectroscopy, also participated in the round table discussion. He shared his experiences and advice on how to pursue a career in industry.

Agilent scientific events

There was a large turnout for the Agilent lunch seminar/discussion forum, with more than 178 registrations. The focus of the event was how Agilent ICP-QQQ technology had enabled five emerging talents in atomic spectroscopy to develop new methods and workflows. Moderated by Lieve Balcaen, University of Ghent, and Agilent's Glenn Woods, Nor Laili Azua Jamari, TESLA, University of Aberdeen, UK; Simone Bräuer, Karl-Franzens-Universität Graz, Austria; Raquel Larios, LGC Limited, UK; Diego Bouzas Ramos, Universidad de Oviedo, Spain; and Naoki Sugiyama, Agilent, Japan, spoke about their experiences in various fields of research, from geochemistry, environmental, and food applications to nanoparticles and life science research.

To help understanding of ICP-MS technology, Agilent's Glenn Woods and Naoki Sugiyama gave a short educational course entitled "Understanding Mechanisms of ICP-MS/MS for Resolving Polyatomic, Isobaric, and Other Spectral Interferences". The session covered the fundamentals of ICP-QQQ (tandem mass spectrometry) and explained the benefits of MS/MS for resolving problematic spectral interferences.

Analytical trends

Compared to the EWCPS 2015, there was a significant increase in the number of poster presentations that used Agilent's ICP-QQQ, reflecting the importance of this technology to the scientific community. Looking back at the last few EWCPS conferences, the number of posters citing Agilent's ICP-MS and ICP-OES/MP-AES technology has continued to grow. A review of all of the posters at this conference showed that 37% of presenters used Agilent's technology - more than any other manufacturer. In addition, Agilent staff presented 22 posters and 4 oral presentations. See page 8 for more information.

Agilent social events

Agilent's highly anticipated evening event was one to remember. Delegates were invited to enjoy traditional Tyrolean cuisine in a rustic ski chalet while enjoying live music and a magic show! Around 200 people either walked to the venue in snow shoes or traveled by snow cat! It was the perfect opportunity to build and renew friendships, share experiences, and have a good time.

Congratulations to Plasma Prize Winners

Joanna Szpunar, Research Council of France (CNRS), Pau, France, was awarded the prestigious European Award for Plasma Spectrochemistry. As sponsors of the award since its inception in 2002, Agilent's Sayuri Otaki, ICP-MS Marketing Manager, presented the eighth prize in the series.

She also presented the first European Rising Star Award for Plasma Spectrochemistry to Johanna Irrgeher, Helmholtz-Zentrum Geesthacht, Germany. Both awards aim to support plasma spectrochemical developments and applications in Europe.

Sponsorship of these two prizes underlines Agilent's continued commitment to supporting high-quality research and innovation in plasma spectrochemistry, at all stages of a scientist's career.

The next WPC will take place in Florida in 2018 and the EWCPS 2019 will take place in Pau, France.

New! ESI prepFAST ICP-MS MassHunter Plug-in

Steve Wilbur Agilent Technologies, USA

Agilent ICP-MS users can simplify the routine elemental analysis of environmental, pharmaceutical, and other sample types samples using Elemental Scientific's (ESI) fully automated prepFAST autodilution system.

Based on the ESI FAST autosampler, prepFAST uses precise and accurate syringe-based dilution technology that is capable of:
- Discrete sampling to reduce sample run times to around 1 min or less.
- Automated, real-time preparation of calibration standards from a single stock solution located in the autosampler rack.
- Prescriptive autodilution: The analyst specifies the dilution factor for each sample ahead of time in the method Batch file, and prepFAST dilutes the sample accordingly, directly from the autosampler.
- Intelligent autodilution: The operator specifies QC limits for out of range analytes and internal standards. MassHunter intelligently calculates the necessary dilution factors for any out of range samples based on these criteria. prepFAST will dilute the sample using the calculated dilution factor prior to re-analysis.
- Precision syringe loading with the prepFAST M5 allows for dilution of small sample volumes or viscous samples.
- Automated tuning with the TuneSelect valve allows the ICP-MS to be tuned and optimized without operator input.

Operation and control of the prepFAST is seamlessly integrated into the Agilent ICP-MS MassHunter software. The ESI software plug-in for MassHunter 4.3 allows all prepFAST functions to be operated from within the MassHunter Batch software. By fully integrating prepFAST control in this way, auto-calibration and auto-dilution functionality become part of the method.
www.icpms.com/products/prepfast.php

Education Spotlight: Free Access to Agilent EWCPS 2017 Presentations

- **Technical Course:** Understanding mechanisms of ICP-MS/MS for resolving polyatomic, isobaric, and other spectral interferences.
  Scientific poster title
- Investigation of the potential of the ICP-QQQ for the quantification of metals in organic solvents and LC-ICP-QQQ for separation of metal complexes by GPC
- Analysis of Platinum Group Elements (PGEs) in road dust using the Agilent 8900 Triple Quadrupole ICP-MS in MS/MS mode
- Accurate determination of Eu, and Sm in ultra-pure barium carbonate materials by ICP-QQQ
- Analysis of radioactive iodine-129 by ICP-QQQ using MS/MS mode and a new octopole reaction cell with axial acceleration
- Determination of ultra-trace level impurities in high-purity metal samples by ICP-QQQ
- Practical benefits of abundance sensitivity using ICP-QQQ
- Multi-element analysis of petroleum crude oils using an Agilent 7900 ICP-MS
- Alternative sample preparation and analysis approach for ICH/USP controlled metals by ICP-MS
- Direct, rapid analysis of undiluted seawater using ICP-MS with an aerosol dilution system
- Current trends, analytical workflows and a case study in extractables and leachables analysis, combining LC/MS, GC/MS and ICP-MS data analysis
- Evaluation of sample preparation methods for elemental profiling of wine by ICP-MS: comparison of direct dilution microwave digestion and filtration
- Elemental differences in single vineyard Pinot noir wines from six neighborhoods within one wine region
- Elemental profiles of whiskies allow differentiation by type and region by inductively coupled plasma – optical emission spectroscopy (ICP-OES)
- Fundamental studies of a nitrogen microwave plasma for analytical emission spectrometry
- Ultra-high speed analysis of soil extracts using an advanced valve system installed on an Agilent 5110 SVDV ICP-OES
- Improved productivity for the determination of metals in oil samples using the Agilent 5110 Radial View (RV) ICP-OES with advanced valve system
- Routine analysis of total arsenic in Californian wines using the Agilent 4200/4210 MP-AES
- Direct determination of Al, B, Co, Cr, Mo, Ti, V and Zr in HF acid-digested nickel alloy using the Agilent 4210 MP-AES

You can download a copy of the technical course and posters from:
www.agilent.com/en-us/promotions/did-you-miss-ewcps-2017.

Conferences. Meetings. Seminars.

Pittcon 2017, March 5-9, Chicago, Illinois, USA, **www.pittcon.org/**
Interphex, June 28-30, Tokyo, Japan, **www.interphex.jp/en/**
International Conference on the Biogeochemistry of Trace Elements, July 16-20, Zurich, Switzerland, **http://icobte2017.ch/**
Goldschmidt 2017, Aug 13-18, Paris, France, **https://goldschmidt.info/2017/**
6th International Symposium on Metallomics, Aug 14-17, Vienna, Austria, **www.metallomics2017.at/**
JASIS, Sept 6-8, Makuhari Messe, Japan, **www.jasis.jp/en/**

Agilent ICP-MS Publications

- **App note:** Multi-Element Analysis of Petroleum Crude Oils using an Agilent 7900 ICP-MS, **5991-7826EN**
- **App note:** High throughput, Direct Analysis of Seawater using the Agilent 7800 ICP-MS with HMI for Aerosol Dilution, **5991-7936EN**

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