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Maximizing Throughput of Soil Sample Analysis using 7900 ICP-MS with ISIS 3 Discrete Sampling

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Introduction

Increased competition and financial pressure has led contract environmental laboratories, including those involved in the analysis of complex high matrix samples such as soils and sludges, to focus more on productivity. At the same time, it is essential that data quality and ease-of-use are not compromised. In response to the need for the highest possible productivity, Agilent has developed a third generation Integrated Sample Introduction System (ISIS 3). By combining the unique benefits of a collision cell that operates effectively with an inert cell gas (helium), aerosol dilution using Agilent's Ultra High Matrix Introduction (UHMI) technology, and discrete sampling with ISIS 3, a rare synergy has been achieved. This has resulted in a much faster system with improved ease-of-use and superior matrix tolerance, allowing Agilent 7900 ICP-MS users to perform high speed discrete sampling analysis of complex soil samples while maintaining full compliance with US EPA requirements for data integrity.

Experimental

An Agilent 7900 ICP-MS fitted with standard nickel cones, glass concentric nebulizer and UHMI option was used for the analysis. UHMI maximizes the plasma robustness of the 7900 ICP-MS through a combination of aerosol dilution and automated plasma temperature optimization. Compared to the previous generation HMI used on the Agilent 7700 Series ICP-MS, UHMI with the 7900 provides a wider range of aerosol dilution (up to 100x) and improves sample washout performance.

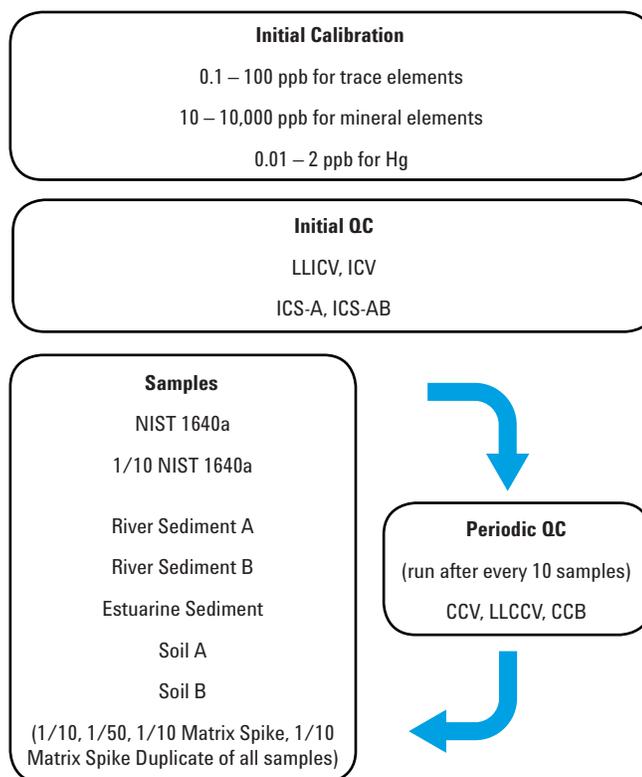


Figure 1. Sequence of samples analyzed in a single run. Sample Block was repeated continuously with automatic insertion of Periodic QC Block after every 10 sample runs. Total number of samples analyzed in 9 hours 35 minutes was 383.

The 7900 ICP-MS was fitted with the ISIS 3 option optimized for discrete sampling (ISIS-DS) to achieve the required high sample throughput. ISIS-DS also contributes to further improvement in matrix tolerance for large sample batches by minimizing the period that the instrument is exposed to the sample during each measurement. The ISIS 3 switching valve is positioned close to the nebulizer to minimize the tubing length and optimize the discrete sampling analysis cycle. A seventh port on the ISIS 3 switching valve allows the internal standard (ISTD) solution to be added online to the carrier flow in the valve, providing efficient mixing of the solutions and rapid stabilization prior to nebulization.

Performance testing over 9 hours

Accuracy, precision, productivity and long-term stability were tested by analyzing a long sequence of samples simulating a typical workload in a contract environmental laboratory. The samples consisted of Certified Reference Materials (CRMs) for water, soil, and sediment, sample-spikes and Quality Control

(QC) samples as specified by EPA method 6020A (Figure 1).

EPA 6020A compliant analysis in less than 90 seconds per sample

EPA method 6020A is a performance-based method. Consequently, unlike method 200.8 for drinking water analysis, the EPA has not restricted the use of collision/reaction cell (CRC) technology for method 6020 applications.

The fast cell gas switching capability of the Agilent 7900 permits the use of multiple gas modes even for the short acquisition times required with discrete sampling. Data quality is maintained when short integration times are used, due to the 7900 instrument's very high sensitivity. Here we used He cell mode for the analysis of most elements and no gas mode for low mass elements. In all, 383 samples were measured in 9 hours 35 minutes with a run-to-run time of less than 90 seconds per sample. The throughput was increased by ~ 30% compared to a similar study carried out using a 7700x ICP-MS with ISIS 2.

Table 1. Mean measured values, percent Relative Standard Deviations (%RSDs), and mean recoveries for all certified elements in the two soil CRMs analyzed. Blank cells indicate no certified value.

Isotope/ Element	Soil A (1/10, n=14)*			Soil B (1/10, n=14)*		
	Mean conc. (ppb)	%RSD	Mean recovery (%)	Mean conc. (ppb)	%RSD	Mean recovery (%)
9 Be	ND			ND		
23 Na	7,659	1.2	109	10,980	1.7	110
24 Mg	7,583	1.1	108	8,720	2.0	109
27 Al	50,750	1.1	101	71,180	1.7	102
39 K	19,870	3.0	99	20,920	3.1	100
44 Ca	33,620	2.1	96	12,140	2.2	97
51 V	10.4	0.7	104	82.7	1.6	103
52 Cr	0.36	32.4		41.6	1.6	104
55 Mn	10.4	1.4	104	10,055	1.8	101
56 Fe	20,540	0.5	103	36,110	1.6	103
59 Co	0.34	1.1		11.0	2.1	110
60 Ni	31.0	1.2	103	21.3	1.7	106
63 Cu	30.8	1.3	103	326	2.3	109
66 Zn	99.6	0.9	100	7,050	1.7	101
75 As	20.2	1.4	101	607	2.1	101
78 Se	1.00	13.9	100	ND		
95 Mo	0.044	10.7		0.16	5.2	
107 Ag	0.020	6.3		0.080	4.7	
111 Cd	0.37	3.3		20.5	1.7	103
121 Sb	3.13	1.0	104	40.9	1.7	102
137 Ba	493	0.5	99	697	1.6	100
201 Hg	0.048	5.3		0.007	29	
205 Tl	0.016	4.1		0.15	2.6	
208 Pb	39.0	1.7	98	6,352	2.6	106
232 Th	10.0	2.5	100	10.2	3.3	102
238 U	1.01	3.2	101	25.6	3.6	103

* Concentration of 1/10 diluted solution. Matrix concentration of Soil A was 441 ppm and Soil B was 482 ppm. ND: less than detection limit

Recovery of Certified Values

Six certified reference material solutions were analyzed repeatedly. They were NIST 1640a Natural Water (NIST, Gaithersburg MD), CRM River Sediment A, CRM River Sediment B, CRM Estuarine Sediment, CRM Soil A and CRM Soil B (High Purity Standards - Charleston SC, USA). NIST 1640a was analyzed undiluted, while the other reference materials

were analyzed after both 10x and 50x dilutions. Matrix concentrations of the 10x diluted solutions were 235 - 480 ppm. Values for the two soil CRMs shown in Table 1 were taken from the 10x dilutions. Each sample was measured multiple times throughout the sequence and the mean concentration, percent relative standard deviation (% RSD), and mean recovery were calculated for

each analyte (Table 1). Not all reference materials are certified for all analytes - blank cells indicate the absence of a certified value.

It is noteworthy that while the 7900 is capable of quickly and accurately measuring trace elements in natural waters, this study demonstrates that the instrument is also able to measure very high concentration mineral elements accurately in high matrix sample digests, under the same analytical conditions and in the same run as all of the trace elements. The aluminum concentration in 1/10 Soil B is 70 ppm. The measured concentration of 71 ppm represents 102% recovery, even though the highest calibration standard (100 ppb) was nearly 1000x below the measured sample value.

Conclusions

Long sequences of high Total Dissolved Solids (TDS) samples can be analyzed with excellent accuracy, precision, and long-term stability using the Agilent 7900 ICP-MS with UHMI option and ISIS 3 operated in discrete sampling mode. The ISIS 3 has a high-speed intake pump and close-coupled 7-port switching valve to maximize productivity. The net benefit is simpler operation, higher throughput and improved long term stability over conventional ICP-MS systems.

More Information

For a full account of this application, download Agilent application note: **Maximizing productivity for high matrix sample analysis using the Agilent 7900 ICP-MS with ISIS 3 discrete sampling system:** EPA 6020A compliant analysis in less than 90 seconds per sample, 5991-5208EN.

Direct Analysis of Trace REEs in High Purity Nd₂O₃ using 8800 ICP-QQQ

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Introduction

Advanced technology products containing Rare Earth Elements (REEs) are evolving at a rapid pace. Consequently, the use of REEs has extended from well-established applications such as glass polishing to high-performance magnets, high-tech catalysts, electronics, glass, ceramics, and alloys. An alloy of the second most abundant REE, neodymium (Nd), with iron and boron (NIB) is an important material in the super permanent magnets that are used in vehicle components, computer data storage devices, MRI scanners and loudspeakers. As REEs are increasingly used in high-tech products, quality control is important. For example, the presence of other REEs as contaminants in a purified single-element REE material may affect the functionality of the final product, so impurities in the REE oxide raw material must be carefully controlled.

The measurement of mid- and high-mass REEs in a low-mass REE matrix is challenging for ICP-MS because REEs have high metal-oxide (M-O) bond strengths, and the oxide ions of the low mass REEs overlap the preferred isotopes of the mid-mass and high-mass REEs. For example, in the analysis of trace REEs in high-purity Nd₂O₃, ¹⁴⁵Nd¹⁶OH₂⁺ and ¹⁴⁶Nd¹⁶OH⁺ overlap the preferred isotope of dysprosium (¹⁶³Dy⁺), ¹⁴³Nd¹⁶O⁺ overlaps the only isotope of terbium (¹⁵⁹Tb⁺) and ¹⁴⁸Nd¹⁶OH⁺ overlaps the sole isotope of holmium (¹⁶⁵Ho⁺). While separation of the trace REEs from the REE matrix can be performed using a chelating resin, this technique is time-consuming and needs to be customized to the particular analyte and matrix under investigation. Clearly there is a requirement for a method capable of the direct analysis of trace REEs in a variety of high purity REE matrices.

In this study, an Agilent 8800 ICP-QQQ was used for the direct analysis of 13 trace REEs in high-purity Nd₂O₃.

Experimental

A standard Agilent 8800 ICP-QQQ with nickel interface cones was used. The sample introduction system consisted of a MicroMist glass concentric nebulizer, a Peltier-cooled quartz double-pass Scott-type spray chamber, and a quartz torch with 2.5 mm injector. The 8800 ICP-QQQ features High Matrix Introduction (HMI) aerosol dilution technology, that reduces the total sample load introduced to the plasma by accurately and reproducibly controlling aerosol dilution. A preset plasma condition (HMI-L) was selected in the ICP-MS MassHunter software to achieve a robust plasma for the introduction of a 500 ppm Nd₂O₃ sample. To compare the efficiency of removing Nd-based polyatomic ions, five cell modes (no gas, He, O₂ mass-shift, NH₃ on-mass and NH₃ mass-shift) were tested. Table 1 summarizes the tuning conditions used in the study.

Table 1. ICP-QQQ tuning parameters (NH₃ as 10% NH₃ in He)

RF (W)	1500
Carrier gas (L/min)	0.6
Make up gas (L/min)	0.5
Sampling depth (mm)	8
He (mL/min)	5
O ₂ (mL/min)	0.3
NH ₃ on mass (mL/min)	8.0
NH ₃ mass-shift (mL/min)	3.0

Five calibration standards [0, 0.1, 0.5, 2.0 and 5.0 ppb] were prepared from an Agilent REE mixed standard (Part No. 8500-6944). Rhodium (Rh) and rhenium (Re) were used as internal standards (ISTD). High purity Nd₂O₃ (99.999%, purchased from the Baotou Research Institute of Rare Earths, China) was dissolved gently in semiconductor grade HNO₃, diluted to 500 ppm as Nd₂O₃ and analyzed for 13 REE impurities by ICP-QQQ.

Results and Discussion

Thirteen trace REEs were measured in the Nd₂O₃ sample using the five different cell modes. The results are summarized in Table 2. As expected, the Background Equivalent Concentration (BEC) of low- and mid-mass REEs, such as La, Ce, Pr, Sm,

Eu and Gd (Pr and Sm were present as impurities) were comparable in all modes, as these elements are free from interferences due to Nd. In contrast, the BECs for high-mass REEs in He mode were lower than in no gas mode, suggesting that high-mass REEs suffer interferences from Nd-derived polyatomic ions.

O₂ mass-shift mode

All 13 REEs react with O₂ efficiently to form REE-oxide ions, as shown below.



The MS/MS capability of the 8800 ICP-QQQ enables the removal of spectral interferences on each element using "mass-shift". For example in O₂ mass-shift mode, all 13 REEs can be detected as REE-O⁺ ions at 16 amu higher than the original elemental mass (M+16). O₂ reaction mode with mass-shift further reduced the BEC for Tb, Dy, Ho, Er, Tm, Yb, and Lu, compared to He mode.

While the improvement in O₂ mass-shift mode is significant for Tb, Dy and Ho that suffer intense interference from NdO⁺, the BECs of the other high-mass REEs such as Er, Tm, Yb and Lu were also improved in this mode, indicating that these elements also suffer interferences from Nd-based polyatomic ions: ¹⁵⁰NdOH₃⁺ interferes with ¹⁶⁹Tm⁺, ¹⁴²NdN₂⁺ (or ¹⁴²NdCO⁺) and ¹⁴⁴NdCN⁺ with ¹⁷⁰Er⁺, ¹⁴²NdO₂⁺ with ¹⁷⁴Yb⁺, ¹⁴³NdO₂⁺ and ¹⁴⁴NdONH⁺ (or ¹⁴⁴NdC₂H⁺) with ¹⁷⁵Lu⁺. The contribution of the above mentioned interferences on Er, Tm, Yb and Lu are not overly significant. However, O₂ mass-shift mode was shown to be an effective approach for the removal of all polyatomic ion interferences, leading to a 5-10x lower BEC compared to no gas mode.

NH₃ on-mass mode for Dy and Ho

A previous study showed that NH₃ cell gas reacts with many of the polyatomic ions that interfere with the REEs. However, NH₃ also reacts quickly with some of the REE ions, leading to reduced sensitivity of < 1 cps/ppt for La, Ce, Nd, Sm, Gd, Tb and Lu. NH₃ on-mass mode is valuable for the determination of a limited number of REEs; Pr, Eu, Dy, Ho, Er, Tm and Yb [1]. The results in Table 2 show that NH₃ on-mass mode gave excellent results for Dy and Ho in the Nd₂O₃ matrix, with an improvement in BECs of 20x compared to O₂ mass-shift mode.

Table 2. BECs of 13 REEs in 500 ppm Nd₂O₃. All units ug/kg (ppb)

Element	Isotope	No gas	He	O ₂ mass shift	NH ₃ on mass	NH ₃ mass shift
La	139	0.143	0.127	0.143	–	–
Ce	140	0.018	0.012	0.011	–	–
Pr	141	1.376	1.202	1.056	–	–
Sm	152	1.061	0.950	0.999	–	–
Eu	153	0.032	0.026	0.028	–	–
Gd	155	0.035	0.046	0.033	–	–
Tb	159	442.6	74.6	1.258	–	0.022
Dy	163	250.3	196.0	1.161	0.040	–
Ho	165	20.43	16.2	0.101	0.004	–
Er	170	0.065	0.020	0.013	–	–
Tm	169	0.084	0.031	0.003	–	–
Yb	174	0.251	0.120	0.058	–	–
Lu	175	0.014	0.006	0.004	–	–

NH₃ mass-shift mode for Tb

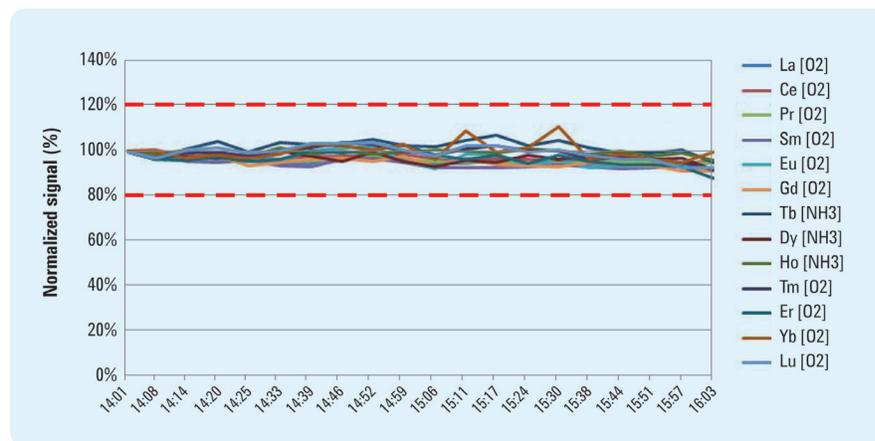
For the REEs that react efficiently with NH₃ (La, Ce, Nd, Sm, Gd, Tb and Lu), NH₃ mass-shift mode can be used. In this study, NH₃ mass-shift mode was investigated for the determination of Tb. In order to find the most appropriate ammonia-cluster product ion for Tb, a product ion scan was performed for the ¹⁵⁹Tb isotope by introducing a 10 ppb Tb solution. Q1 was set at *m/z* 159, allowing only ions at the mass of the target precursor ion (¹⁵⁹Tb) to enter the cell. Q2 was scanned over a selected mass range to measure all of the product ions formed in the cell via NH₃ reaction with ¹⁵⁹Tb. The scan revealed the four most abundant cluster ions: TbNH⁺ (at Q1+15 amu), TbNH(NH₃)⁺ (at Q1+32 amu), Ti(NH₃)₄⁺ (at Q1+68 amu), and Ti(NH₃)₅⁺ (at Q1+85 amu). For each of the four candidate cluster ions, the BEC of Tb in a Nd matrix was studied, and TbNH⁺ (*m/z* 174) was found to give the lowest BEC. A BEC of 22 ppt for Tb in a 500 ppm Nd₂O₃ solution was achieved, which is 50x lower than the result achieved in O₂ mass-shift mode, indicating the effective removal of the NdO⁺ overlap.

Spike recoveries and long term stability

To validate the method, a spike-recovery test was carried out by analyzing a spiked solution containing 0.5 ppb REE mixed standard in a 500 ppm Nd₂O₃ sample. NH₃ on-mass mode was used for the determination of Dy and Ho, NH₃ mass-shift mode was used for Tb, and O₂ mass-shift mode for remaining REEs. The

recoveries for all elements was good, demonstrating the sensitivity and effectiveness of the method.

Long term stability over 2 hours was also checked using the same spiked sample. The stability of each REE signal is illustrated in Figure 1. Excellent stability (<5% RSD) was achieved, demonstrating the applicability of the method for the routine analysis of high purity REE materials using the Agilent 8800 ICP-QQQ.

**Table 1.** Signal stability of 13 trace REEs spiked at 0.5 ppb in a 500 ppm Nd₂O₃ sample solution

Conclusions

The Agilent 8800 Triple Quadrupole ICP-MS with MS/MS capability was used to successfully measure 13 REE impurities in a high-purity Nd₂O₃ sample solution. With the combination of Agilent's HMI and MS/MS reaction cell mode, the 8800 ICP-QQQ provided effective removal of the polyatomic interferences from the Nd matrix. Good long term stability was achieved over 2 hours for all trace REEs present in the 500 ppm Nd₂O₃ sample, demonstrating the validity of the analytical method for the direct analysis of high purity Nd₂O₃.

References

1. Naoki Sugiyama and Glenn Woods, Direct measurement of trace rare earth elements (REEs) in high-purity REE oxide using the Agilent 8800 Triple Quadrupole ICP-MS with MS/MS mode, Agilent publication, 2012, 5991-0892EN.

Comprehensive Software Maintenance Agreements for ICP-MS MassHunter Software

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Introduction

Starting August 2014, every new Agilent ICP-MS MassHunter software product installed is automatically covered by a 1-year Agilent Software Maintenance Agreement (SMA).

The offer extends to all ICP-MS MassHunter software whether purchased with a new ICP-MS or purchased as a software upgrade for an older system.

The SMA provides 1-year subscription access to free software updates, upgrades, and media, as well as unlimited telephone based software support. The Agilent SMA protects your ICP-MS MassHunter software investment, keeps the software running at its highest level, and provides access to the knowledge of Agilent software experts.

At the end of the first year, the SMA may be renewed to guarantee the ongoing provision of these advantages, with the level of software updates or upgrades available dependent on the SMA you have purchased.

Activating the SMA

ICP-MS MassHunter software registration automatically activates the first year SMA. ICP-MS MassHunter software registration is accomplished via Agilent's SubscribeNet portal – a web based service that provides registered users 24 hours a day, 7 days a week access for software and SMA license management.

Stay up-to-date

Your newly activated SMA insures that MassHunter software updates & upgrades are immediately available via download and media request.

Both services (download & media delivery) are free to owners of current Agilent SMAs.

Maintaining your ICP-MS software on the latest version provides you access to new software features as they become available and maintains maximum software and instrument efficiency.

All software users who are registered in SubscribeNet may also elect to receive automatic email notifications regarding new software version availability, patches and security updates, as well as SMA contract expiration and renewal notification.

Access to Agilent Software Experts

An Agilent SMA provides ICP-MS MassHunter software users access to unlimited telephone based software support. Agilent's software support team has access to MassHunter software professionals who can quickly answer software related questions. Expert help reduces support calls, reduces instrument downtime, helps users learn how to use the ICP-MS MassHunter software to its greatest advantage, keeps the system running at peak efficiency, and allows MassHunter users to focus on analytical results, rather than on the software.

Effectively Manage Software Costs - A Case Study

An Agilent SMA is an excellent means to manage software update costs and avoid budget surprises. For example, Microsoft XP software recently reached end-of-support. At that time, many corporate IT departments demanded that all software running on the Windows XP platform be upgraded to newer Windows platforms or be removed from the corporate networks. Users of software running on Windows XP were faced with a potentially costly choice—upgrade the analytical software or abandon the analytical instrument the software controlled.

However, the ongoing protection afforded by the SMA for instruments supported by the newest revision of MassHunter minimizes unexpected costs, for example by insuring that the instrument software can easily be updated to a version supported on a newer operating system that might be required as part of a standardized corporate IT environment.

Conclusions

When you purchase a new Agilent ICP-MS MassHunter software product, your investment is protected. Your recently purchased ICP-MS MassHunter software includes an SMA which provides you with a 1-year subscription to software updates, upgrades, and media, as well as 1-year of unlimited telephone based phone support. The Agilent SMA will help you maintain your laboratory efficiency and uptime, and allow you to focus on what is important to you – results.

More Information



Enjoy the benefits of a Software Maintenance Agreement now:

- Updates and upgrades
- Unlimited phone support
- Single software version
- SubscribeNet portal access
- Automatic notifications

Software Maintenance Agreements

www.agilent.com/chem/sma

Boost 7900 Productivity with Video Tutorials and Revised Maintenance Schedules

Takushi Nakamura

Agilent Technologies, Tokyo, Japan

Self-paced Reference Tools

Agilent understands that initial product & software familiarization and training is critical in order for users to achieve reliable and accurate results with maximum instrument uptime. With this in mind, customer familiarization at installation of the 7900 ICP-MS includes on-site mentoring by an Agilent Field Service Engineer (FSE), and extensive eFamiliarization, which are self-paced instructional videos for training, to be used by users exactly when needed, at their own convenience.

7900 ICP-MS eFamiliarization has recently been updated and now includes 30 tutorials, available in English, Japanese and Chinese and consisting of:

- 16 MassHunter *Basics* videos covering the common functions required for operating the 7900.
- 12 *Advanced* MassHunter videos including guidance on sampling systems including ISIS 3 and chromatography.
- 2 ICP-MS *Fundamentals* videos that explain the basic components and operation of ICP-MS plus a tutorial on the control of interferences.

Feedback from 7900 ICP-MS users and FSEs has been overwhelmingly positive to date, with many customers finding the tutorials extremely useful. According to Toshifumi Matsuzaki, General Manager of Agilent's Tokyo Analytical Division, "eFam is a new approach for us in ICP-MS and we are already getting great feedback on this innovative way to improve the customer learning experience."

7900 ICP-MS Maintenance Intervals: As Needed

It is important to maintain the Agilent 7900 regularly to extend the useful life of its components and optimize its analytical capabilities



and up-time. Performance of routine maintenance is simplified with the 7900 ICP-MS Maintenance Video disk, containing 41 tutorial videos showing how to perform common tasks. Videos are provided in English, Chinese and Japanese with a total running time of around 1 hour and 48 minutes per language. Choosing the appropriate maintenance schedule for your instrument depends on a number of factors including:

- Number of samples/day
- Sample type and concentration
- Environment of the instrument

Agilent advises that maintenance tasks on the 7900 ICP-MS should be carried out "as and when needed" but for your convenience, we have set out a "good-practice" schedule.

Weekly:

- Check and clean your sample introduction tubing, peristaltic pump tubing, glassware and interface cones.
- Re-prepare or re-dispense tuning solutions and rinses.

Monthly or more frequently depending on your workload:

- Check rotary pump oil level and condition of oil mist filter, check extraction lens and clean if discolored.

6 monthly

- Check extraction and off-axis lenses, and clean if discolored. Change rotary pump oil, replace O-rings, drain bushing, check/replace pump mist filter.
- Check ORS entrance and exit lenses, and clean if discolored.

Infrequently performed, but important tasks:

- Check/replace all PTFE lines, including autosampler probe.
- Rotary pump oil normally lasts 6 months, however 24/7 use, especially with high matrix samples will degrade the oil more quickly, and the oil may deepen in color and require changing sooner.

MassHunter will automatically generate a Performance Report if selected to do so in the Start Up task. All meter readings and current status are captured and logged.

More information

The 7900 ICP-MS Maintenance Video Disk can be downloaded from Agilent's SubscribeNet.

eFamiliarization for Agilent 5100 ICP-OES

Self-paced instructional videos are also available for the Agilent 5100 ICP-OES. The on-demand eFamiliarization training includes:

- 12 software and method development videos
- 5 sample introduction videos
- 11 maintenance videos

Availability

A DVD containing the 5100 ICP-OES eFamiliarization content is distributed with the ICP Expert software package, with each 5100 ICP-OES that is shipped and installed.

Agilent 7700 ICP-MS on Public Display at Tamarokuto Science Center in Japan



An Agilent 7700 ICP-MS shell is on show at Tamarokuto Science Center in Tokyo, Japan. The ICP-MS is part of the Science Center's existing exhibition to introduce the general public to the world of the "atom".

Tamarokuto Science Center, located 10 miles away from Agilent's ICP-MS R&D center in Hachioji, is the largest science museum in the western area of Tokyo. It offers a wide variety of exhibitions with 5 rooms dedicated to: "Meet the Science", "Body & Senses", "System & Mechanism", "Life & Environment", and "Geoscience". The science center is a popular destination for school and college trips, as well as family visits. In fact, more than 200,000 people visited the museum last year. Visitors will find the 7700 ICP-MS in the Science Center's "Meet the Science" room.

Three explanatory panels and a video provide an overview of the basic concepts of ICP-MS, allowing visitors to understand how ICP-MS measures atomic ions. Examples are also given of how ICP-MS impacts on our everyday lives through drinking water testing, contamination monitoring in the semiconductor industry, and tracing the geographic origin of food products.

Next to the ICP-MS, there is an interactive periodic table that explains which elements are used in which products. As an elemental analysis technique, Agilent's 7700 ICP-MS is a perfect match for the exhibition, and gives the general public a unique opportunity to see a cutting edge analytical system normally only found in working laboratories.

This information is subject to change without notice.

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Join Agilent at the Winter Plasma Conference 2015 in Germany

Meet our team of atomic spectroscopy experts at the European Winter Conference on Plasma Spectrochemistry in Münster (Germany), from February 22-26, 2015. Visit Agilent's booth in the exhibition hall and join us at our events. Details on lunch seminars, workshops and social events will be available soon. Please contact your local Agilent representative for more information.



The 7th European Award for Plasma Spectrochemistry

Donated by Agilent Technologies, the "Plasma Award" is designed to promote analytical plasma spectrochemical developments and applications in Europe and is awarded for a single piece of outstanding work or for a continued important contribution in this field. It will be presented on Sunday February 22, 2015.

Further details on the conference can be found at www.ewcps2015.org

Conferences. Meetings. Seminars.

- **WQTC/AWWA**, Nov 16-20, New Orleans, LA, USA, www.awwa.org
- **EAS**, Nov 17-19, Somerset, NJ, USA, www.eas.org
- **AGU**, Dec 15-19, San Francisco, CA, USA, <http://fallmeeting.agu.org/2014/>
- **Mining Indaba**, Feb 9-12, 2015, Cape Town, South Africa, www.miningindaba.com
- **European Winter Conference on Plasma Spectrochemistry**, February 22-26, 2015, Münster, Germany, www.ewcps2015.org

Agilent ICP-MS Publications

To view and download the latest ICP-MS literature, go to www.agilent.com/chem/icpms and search the "Library".

- **Application note:** Maximizing productivity for high matrix sample analysis using the Agilent 7900 ICP-MS with ISIS 3 discrete sampling system, 5991-5208EN
- **Application note:** Lead isotope analysis: Removal of ^{204}Hg isobaric interference from ^{204}Pb using ICP-QQQ in MS/MS mode, 5991-5270EN (*Available soon*)
- **Updated white paper:** Proposed new ICH and USP methods for elemental impurities: The application of ICP-MS and ICP-OES for pharmaceutical analysis, 5990-9382EN
- **Flyer:** Elemental impurity analysis in pharmaceuticals, 5991-5314EN
- **Primer:** Atomic Spectroscopy Applications in the Contract Environment Laboratory, 5991-5326EN. Request your copy from www.agilent.com/chem/environmental

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