NEWS

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Application Spotlight

A High-Performance Sample Introduction System for the Agilent® 5100/5110/5800/5900 ICP-OES

Introduction

The standard sample introduction system of your ICP-OES determines many factors, such as detection limits, short term precision, tolerance to different sample types and cost. The analytical performance of your ICP can often be improved by a careful choice of torch, spray chamber and nebulizer components by taking into account the type of samples that will be analysed. Compared to the cost of instrument, argon or analytical reagents, the improvements in detection limits, tolerance to dissolved solids, sample throughput and running costs with the appropriate selection of sample introduction components can represent outstanding value.

In this article, we focus on the “hard to measure” ICP-OES elements, As, Se and Pb to determine whether we can improve detection limit performance by selection of appropriate sample introduction components.

Experimental

Instrument conditions used in this work are found in table 1 below:

Table 1. Experimental conditions

Experimental Parameter	Setting
RF power	1.2 kW
Nebulizer gas flow rate	0.7 L/min
Plasma gas flow rate	12 L/min
Auxiliary gas flow rate	1.0 L/min
Read time of each Replicate	10 seconds
Number of Replicate Readings	10
Viewing mode	Axial
Sample pump tubing	Black-black
Pump rate	12rpm
Nebulizer	SeaSpray with 2mL/min uptake at 0.7 L/min Ar

GE News

Webinars

Glass Expansion is a world leader in the design, manufacture and support of sample introduction systems for ICP-OES and ICP-MS. As part of our ongoing support to everyday ICP operators, we have now released our ICP Cones 101 webinar series. You can find our latest On Demand Webinars below:

www.geicp.com/webinars

Careers - Product Specialist

Glass Expansion is world leader in the design and manufacture of sample introduction systems for ICP-OES and ICP-MS.

To support our growing business, Glass Expansion has a new position for a Product Specialist based in the Weilburg, Germany office to provide field marketing and technical support to the Glass Expansion distributors and customers across Europe, Middle East and Africa. The successful applicant will be degree qualified with at least 5 years experience developing methods for ICP-MS and/or ICP-OES .

Glass Expansion provides a competitive remuneration package with a supportive, friendly team environment. To be involved with the dynamic, fast-growing successful organization send your resume to the HR manager, Suzie Sharry at ssharry@geicp.com.

In this issue:

GLASS EXPANSION
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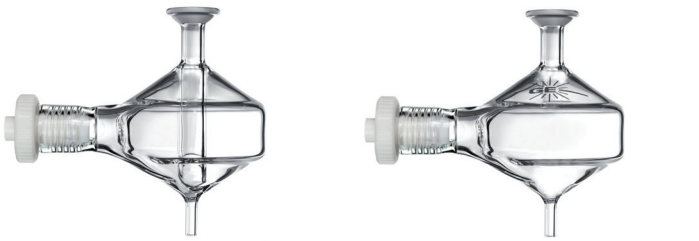
Results and Discussion

In this work we mainly focused on detection limits as the figure of merit. Detection limits on an ICP-OES with a solid-state detector such as the Charged Couple Detector used on the Agilent Technologies® 5100/5110/5800/5900 series of ICP-OES are determined by the sensitivity of the system, background intensity and noise characteristics of the system. At the instrument detection limits, dark current is the predominant source of noise which results in an inverse square law between detectability and integration time. It is possible to improve detection limits of an instrument by simply measuring longer – DL's can be improved by a factor of two through a four-fold increase in integration time. Detection limits calculated in this work used a 10sec integration time, 10 replicates,10 blank measurements and were the average of 3 runs.

Performance of a Double-Pass Spray Chamber versus Tracey™ Single-Pass Spray Chamber

Figure 1. Double-pass cyclonic spray chamber and Tracey™ single-pass cyclonic spray chamber.

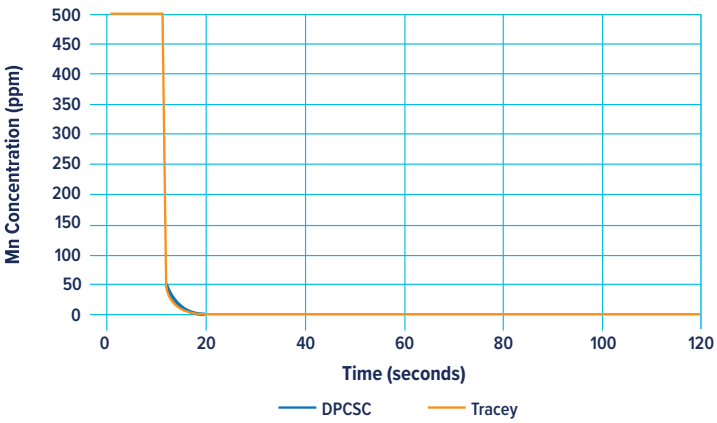


Double Pass Spray Chamber Tracey™ Single-Pass Spray Chamber

In-house testing at Glass Expansion show the standard double-pass spray chamber and nebulizer provided were good quality, with excellent short-term precision and wash-out (see Figure 2.).

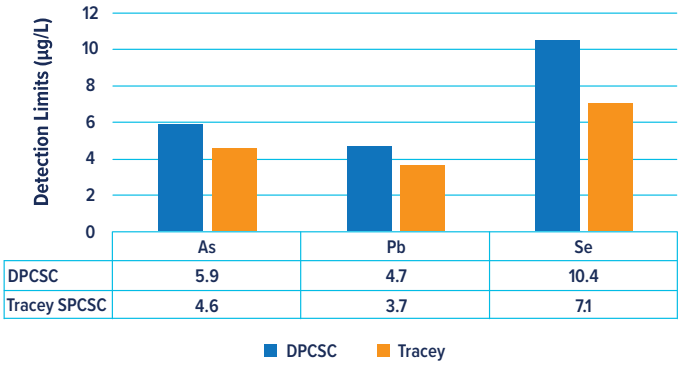
The spray chamber provided as standard on the Agilent Technologies® ICP-OES is a glass double-pass cyclonic type, which features a central baffle to reject large droplets from the nebulizer aerosol.

Figure 2. Comparison of a 500 ppm Mn washout for the Agilent® double-pass spray chamber and Tracey™ single-pass cyclonic spray chamber. A 4 orders reduction in Mn intensity was achieved in 20 seconds for both spray chambers.



Double-pass cyclonic spray chambers (DPCSC) are recommended for high total dissolved solids (TDS) samples or when analysing organic solvents, as more aerosol is rejected by the central baffle and sent to the drain, lowering transport efficiency and compromising detection limit performance. However, for most environmental, food and water samples, a single-pass cyclonic spray chamber (SPCSC) is recommended, giving higher transport efficiency and better detection limits.

Figure 3. Comparison of As, Pb and Se detection limits of a double-pass cyclonic spray chamber versus the detection limits for the Tracey™ single-pass detection limits.



As we can see in Figure 3, when the double-pass spray chamber is replaced with a Tracey™ single-pass spray chamber, detection limits for As improve (reduce) from 5.9 µg/L to 4.6 µg/L, Pb from 4.7 µg/L to 3.7 µg/L and for Se from 10.4 µg/L to 7.1 µg/L. This represents a 22 to 28% improvement in detection limits.

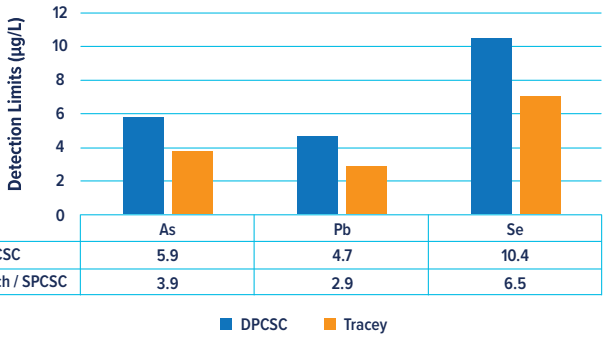
Detection Limits with a D-Torch with Ceramic Outer Tube

The patented D-Torch™ is a revolutionary demountable torch design from Glass Expansion. It uses precision engineered components to lower running costs, increase chemical inertness and provide a choice of injector sizes and materials, without compromising usability or performance. It is available with the option to replace the quartz outer tube with a ceramic outer tube made of highly durable, SiAlON material.

With ceramic outer tube the D-Torch™ offers:

- Improved sensitivity with a hotter, more robust plasma resulting in fewer ionization interferences
- Longer lifetime when analysing difficult sample matrices such as, high salts, borate fusions and organic solvents
- Flexibility – a single D-Torch is suitable for all your analytical needs with a choice of different injector materials and diameters for aqueous, organic, high salt, fusions or HF containing samples
- Lower running costs with the long life ceramic outer tube
- Easier to clean and dry with its' demountable injector and outer tube

Figure 4. Comparison of detection limits with the standard double-pass spray chamber and quartz torch and a Tracey™ single-pass spray chamber and D-Torch™ fitted with a ceramic outer tube.



	As	Pb	Se
Std Torch / DPCSC	5.9	4.7	10.4
Ceramic D-Torch / SPCSC	3.9	2.9	6.5

As can be seen in Figure 4, when the standard quartz torch and double-pass cyclonic spray chamber is replaced with a D-Torch™ with ceramic outer tube and a Tracey™ single-pass spray chamber, detection limits are 3.9 µg/L for As, 2.9 µg/L for Pb and 6.5 µg/L for Se, which is a 30% to 40% improvement in detection limits on the standard sample introduction system.

Conclusions

The combination of D-Torch™ with a ceramic outer tube and Tracey™, single-pass cyclonic spray chamber from Glass Expansion improves the detection limit performance for the hard to excite elements As, Pb and Se on the Agilent Technologies® 5100/5110/5800/5900 ICP-OES. A sample introduction system using a D-Torch™ and Tracey™ spray chamber will give better detection limits, excellent short-term precision and fast washout. Alternatively, if improving detection limits is not the analytical goal, the D-Torch™ and Tracey™ spray chamber will provide the same detection limit performance as the standard sample introduction system but give faster sample throughput by using shorter integration times made possible by the high sensitivity sample introduction system.

Ordering Information	
Part Number	**Product Description**
20-808-8882HE	Tracey Single-Pass Cyclonic Spray Chamber
30-808-3560	D-Torch Demountable Torch for the Agilent® 5100/5110/5800/5900 ICP-OES
31-808-3580	Ceramic Outer Tube
31-808-3576	1.8mm Quartz Injector

Figure 5. A High-Performance Sample Introduction System for the Agilent® 5100/5110/5800/5900 ICP-OES

Glass Expansion Products for the Thermo® PRO ICP-OES

Glass Expansion offers a complete range of nebulizers, spray chambers, D-Torch, peristaltic pump tubing, autosampler probes and other accessories for the PRO ICP-OES from Thermo Fisher Scientific®. Our high performance sample introduction components will reduce your instrument running costs, enhance its performance and improve usability.

The D-Torch replaces the standard EMT torch. It has the option of a patented long-life ceramic outer tube that is ideal for analysis of difficult samples such as brines or organics. The IsoMist XR temperature programmable cyclonic spray chamber simplifies analysis of volatile organics. For samples containing HF acid, Glass Expansion has a range of high performance inert nebulizers such as the DuraMist and PTFE cyclonic spray chambers. Don't compromise your instruments performance just to run samples containing HF acid.

For samples, which require hydride analysis for cold vapor forming elements such As, Sb, Se, Tl and Hg, simply switch over to the HydraMist spray chamber. The Glass Expansion HydraMist is a sensitive, simple-to-use spray chamber that allows simultaneous operation of both conventional pneumatic nebulization and cold-vapor/hydride generation resulting in 10 fold improvements in detection limits. Improve your productivity by analysing non-hydride forming elements and cold vapor elements simultaneously, avoiding system shutdowns to change over between the hydride generator accessory and conventional pneumatic nebulization.

For more information on improving your Thermo® PRO ICP-OES contact us at Glass Expansion or view our complete product range for the new Thermo® PRO Duo and Thermo® PRO Radial ICP-OES on our website.

IsoMist XR

P/N KT-1166-XR

D-Torch

P/N 30-808-4150

DuraMist DC Nebulizer

P/N A31-07-DM1

Elegra Argon Humidifier

P/N 70-803-1303

Ordering Information	
Part Number	**Product Description**
KT-1166-XR	IsoMist XR for Thermo® PRO
30-808-4150	D-Torch for Thermo® PRO Duo
30-808-2877	D-Torch for Thermo® PRO Radial
A31-07-DM1	DuraMist DC
20-809-9198	PTFE Tracey Spray Chamber
70-803-1303	Elegra Argon Humidifier
KT-1160	HydraMist Kit

HydraMist Kit

P/N KT-1160

PTFE Tracey Spray Chamber

P/N 20-809-9198

Glass Expansion Products for the Thermo® PRO ICP-OES

Features and Information

Glass Expansion offers it's popular D-Torch for a wide range of ICP-OES and ICP-MS models and is pleased to release a version for Thermo® PRO ICP-OES. The new D-Torch for the Thermo PRO is a direct replacement for the instrument's standard torch. It incorporates the same easy to use, self aligning feature of the EMT torch. The D-Torch is designed to reduce running costs associated with torch wear when analyzing challenging samples such as organic solvents, oil analysis, fusions or samples containing high total dissolved solids (TDS) or hydrofluoric acid (HF). It is the perfect torch for Tribology, Geological and Trade waste applications.

The revolutionary D-Torch design uses Glass Expansion's acclaimed high precision engineering capabilities to provide a demountable torch without sacrificing performance or usability. The Glass Expansion D-Torch incorporates an alumina intermediate tube, a demountable injector and outer tube. It is no longer necessary to have multiple torches in your lab, as a single D-Torch with the right alumina, quartz or sapphire injector of the appropriate internal diameter can be used for any application from drinking waters through to organics, high TDS or even HF containing solutions. The replaceable outer tube is much more economical to replace than having to replace the complex quartz assembly of the standard torch. Furthermore, when analyzing really difficult sample types, the quartz outer tube can devitrify in a few hours of operation, whilst the optional ceramic outer tube can last years under the same conditions.

Thermo® PRO Duo D-Torch breakdown
P/N 30-808-4150

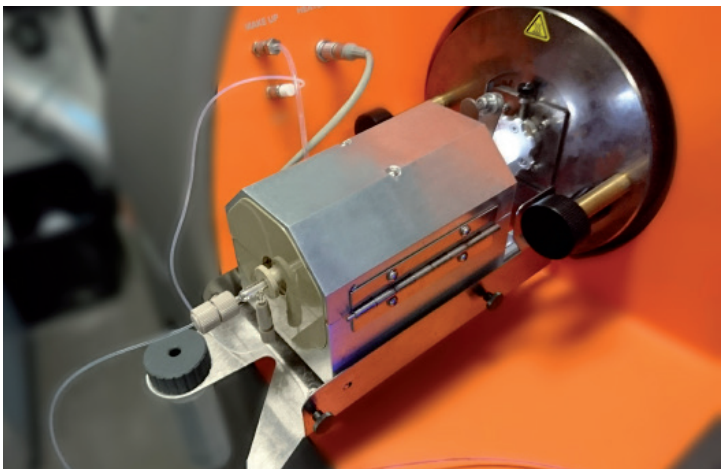
The Major Benefits of the D-Torch are:

- An alumina intermediate tube which resists wear and is tolerant to high temperatures
- A low cost demountable quartz outer tube so just the outer tube can be replaced when worn or damaged
- An optional ceramic outer tube which does not devitrify like quartz, giving a much longer lifetime and significantly lower running costs
- Interchangeable injectors with a choice of internal diameters and materials such as quartz, alumina, and sapphire are available for a wide range of applications and sample types
- Improved Detection limits when combined with the ceramic outer tube option

The D-Torch is a cost-effective alternative to the standard torch that will reduce running costs in any laboratory.

For more information on the D-Torch for the Thermo® PRO ICP-OES visit www.geicp.com/D-Torch

We are pleased to announce the release of our TOF-ICP-MS Mass Cytometers Product line



Products for TOF-ICP-MS Mass Cytometers	
Part Number	**Product Description**
C21-1-UFT02	Nebulizer for Single Cell analysis
FT-16-8-X	Nebulizer Fittings Kit with zero dead volume
70-ELUO	Eluo Nebulizer Cleaner
70-ELUO-OPD	Eluo Large Nebulizer Cleaner
FLUKA25	Nebulizer Cleaning Solution
30-808-8107	Quartz Torch
31-808-4066	WB Injector
31-808-4116	HT Injector
70-900-2006C	RF Coil
FL9001-Ni	Nickel Sampler Cone
FL9005	Nickel Skimmer-Reducer Cone Assembly
70-803-1565	O-Ring for Sampler Cone (pkt 5)
70-803-1564	O-Ring for Reducer Cone (pkt 5)

High Efficiency Nebulizer with zero dead volume Nebulizer Fittings Kit

P/N C21-1-UFT02 & FT-16-8-X

Quartz Torch

P/N 30-808-8107

Eluo Nebulizer Cleaner

P/N 70-ELUO

Fluka Cleaning Solution

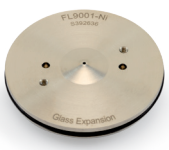
P/N FLUKA25

RF Coil

P/N 70-900-2006C

Nickel Sampler Cone

P/N FL9001-Ni



Nickel Skimmer-Reducer Cone Assembly

P/N FL9005