NEWS

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Glass Expansion News

Winter Conference

A wide selection of Glass Expansion products will be on display at the 2016 Winter Conference on Plasma Spectrochemistry, January 10-16, 2016, Tucson, Arizona, USA.
The display will include nebulizers, spray chambers, torches, RF coils, ICP-MS cones and accessories.
Glass Expansion specialists will be on hand to answer your questions and assist you to choose the optimum components for your ICP.
Please visit us at Booth 39.

In this issue:

APPLICATION *SPOTLIGHT*

Performance of In-Line Addition using the Trident™

Internal standards (IS) are often used in ICP optical and mass spectrometry to correct for matrix based interferences and improve measurement stability.[1] Similarly, an ionization buffer can be utilized for axial view ICPs to suppress the ionization effects of easily ionizable elements (EIE). Whether an IS or ionization buffer is used, this process involves dosing each blank, standard, and sample with a known concentration of a particular element (or elements). When dealing with a large number of samples, this process can be very time consuming. Other concerns are the risk of contamination and the accuracy of volumetric addition.

An alternative to premixing the IS or ionization buffer is to add them in-line using a mixing tee. Glass Expansion developed the Trident In-Line Reagent Addition Kit for this purpose.[2] The Trident allows the IS and/or ionization buffer to be automatically mixed with each sample during sample introduction, saving considerable sample preparation time and reducing the risk of error or contamination. The focus of this article is to compare the performance of manual addition (offline) to inline addition of an IS using the Trident. We will also investigate the use of a self-aspirating nebulizer in conjunction with the Trident kit, eliminating the need for peristaltic pump delivery of the sample and IS.

Experimental:

The operating conditions for an Agilent 5100 ICP-OES are listed in Table 1. In this experiment, the Trident Kit relies on the instrument peristaltic pump to accurately dose each sample with an IS or other reagent (Figure 1A). The Trident is offered in two configurations, one kit which includes a glass tee for solutions which do not contain HF and another which includes a PFA tee (Figure 1B) for HF-containing samples. Both kits are completely modular so that damaged or worn components can easily be replaced. The glass tee was used throughout these experiments.

Table 1. Agilent 5100 ICP-OES Operating Parameters

Plasma Gas Flow	12 L/min
Auxiliary Gas Flow	1.0 L/min
RF Power	1350 W
Nebulizer	SeaSpray (P/N ARG-07-USS2)
Nebulizer Gas Flow	0.75 L/min
Nebulizer Flow Rate	1 mL/min (1.4 mL/min self-aspiration)
Peristaltic Pump Tubing - Sample	0.76mm i.d.
Peristaltic Pump Tubing - IS	0.76mm i.d. (with Trident only)
Spray Chamber	Twister (P/N 20-809-9199HE)

The heart of each Trident kit is a custom designed mixing chamber (Figure 2). The tee provides zero dead volume connections on the input ends for the sample and reagent lines. The output end, however, is designed with a small mixing chamber so that the sample and reagent are intimately mixed prior to introduction to the nebulizer. The design of the mixing chamber is vital, and helps the ICP analyst to achieve efficient mixing and maintain a stable ratio of Sample:IS. Other inline mixing devices have used a coil of capillary tubing after the tee to give the sample and IS time to thoroughly mix. The problem with this approach is that the coil adds significant overhead to both the front end (stabilization delay) and the back end (washout). However, even with the efficient built-in mixing chamber of the Trident kit, it is important to note that the instrument stabilization time in the ICP method parameters will need to be adjusted. The additional time required will depend on the mixing ratio. Typically, the more closely matched are the two peristaltic pump tubing diameters (sample and IS), the lower the stabilization time. In these experiments an additional 10 seconds was added to the instrument stabilization time when using the Trident.

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Quality By Design

Figure 1A. Trident In-Line Reagent setup

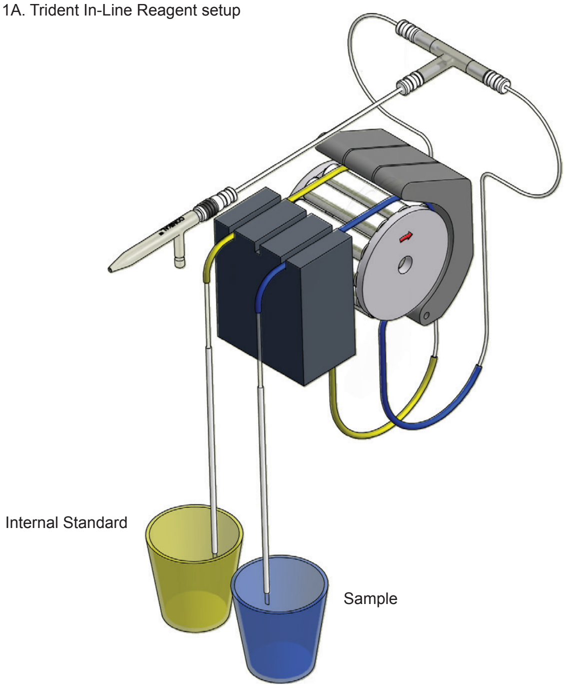
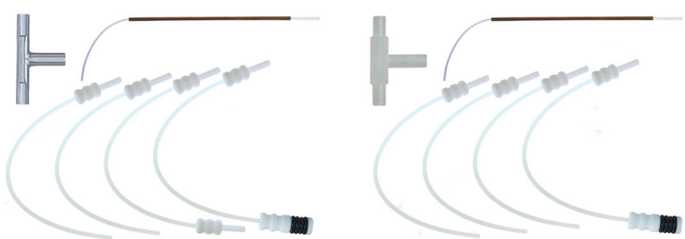


Figure 1B. Trident In-Line Reagent Addition Kits

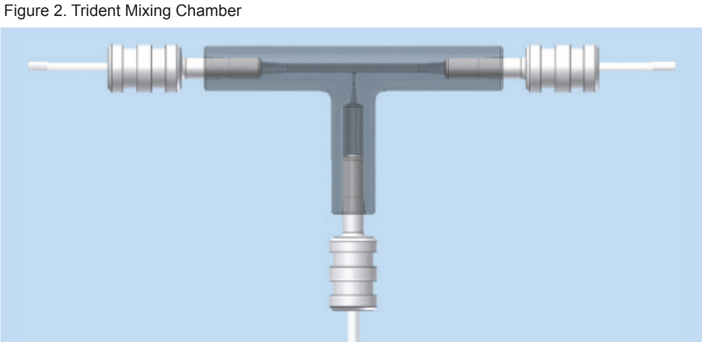


Trident Kit for non-HF solutions

Trident Kit for HF solutions

To evaluate the performance of the Trident a 1ppm yttrium solution was added inline to a 0.5ppm multi-element solution, both via the peristaltic pump and via self-aspiration (1:1 ratio). The yttrium (IS) stability and precision (%RSD) were compared to the same sample introduction system with no Trident, where an yttrium IS was manually added to a 0.5ppm multi-element solution. The final IS concentration for all experiments was 0.5ppm yttrium. The same analysis was performed with self-aspiration instead of the peristaltic pump, both with and without the Trident. Readings for all experiments were taken every 5 minutes over a period of time ranging from 40 to 85 minutes, depending on the experiment.

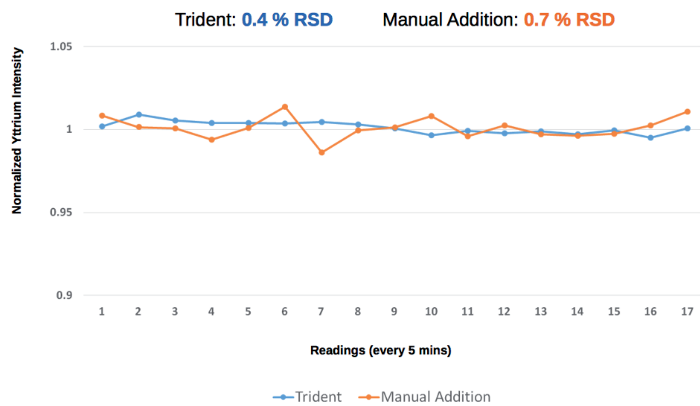
Figure 2. Trident Mixing Chamber



Results:

A comparison of the IS stability and precision achieved with and without the Trident is shown in Figure 3. The stability of IS signal with the Trident closely matches the sample set that was manually spiked with IS. Over a period of 85 minutes, an IS signal precision of 0.4% RSD is achieved with the Trident compared to 0.7% where the IS was manually added. These results show that performance of inline addition with the Trident is at least as precise as manual addition.

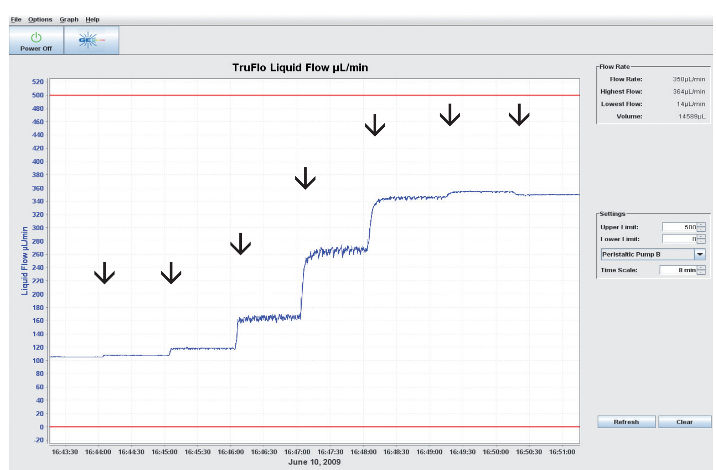
Figure 3. Comparison of Internal Standard Stability – Trident vs. Manual Addition



Since inline addition with the Trident relies, in part, on the stability of the uptake rate of the IS via the peristaltic pump, it is important to check the condition of peristaltic pump tubing and the tension of the clamp. The TruFlo™ real-time sample monitor[3] is a very useful tool to diagnose any problems associated with sample tubing or the nebulizer. By inserting the TruFlo in the IS line, you always know the actual rate of IS uptake to your nebulizer. Placing the TruFlo after the Trident allows for monitoring of the combined flow rate from the sample line and IS line.

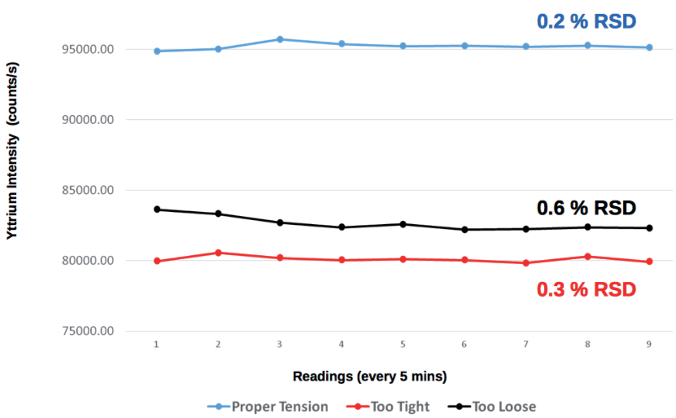
In Figure 4 we show the effects of IS pump tubing tension on IS flow rate as measured with the TruFlo; the clamp was tightened by a half turn at each arrow. The real time display enables you to easily optimize the tension on the peristaltic pump tubing, helping you to maximize the tubing life and improve analytical precision. Too much pressure will result in faster tube wear and more noise. Too little pressure may result in irregular flow and poor long term stability.

Figure 4. Optimization of Pump Tubing Tension using the TruFlo



To evaluate the ICP performance versus the tension applied to the peristaltic pump tubing, we adjusted the clamp from “too tight” to “too loose” to a “proper” tension. While the % RSD of the IS signal is not greatly affected, the yttrium signal varies based on the tension and thus the Sample:IS ratio will change if the proper tension is not used (Figure 5). Adding the TruFlo to the ICP sample introduction system is a simple way to enhance day-to-day reproducibility and reduce the need to repeat measurements because of worn pump tubing or incorrect clamping of the pump tube. The TruFlo can also be used to alert the analyst to a blockage in the nebulizer. For more information on the TruFlo please refer to the [TruFlo webpage.][3]

Figure 5. Comparison of Internal Standard Signal vs. Pump Tubing Tension



Many ICP-MS labs rely on self-aspiration rather than a peristaltic pump for sample uptake. For these applications in-line addition of an internal standard is still possible with the Trident. The Glass Expansion Self-Aspiration Kit combines the Trident with a Glass Expansion concentric nebulizer and a customized autosampler probe. The customized autosampler probe (shown with the optional inline particle filter in Figure 6C) directly connects to the Trident via a zero dead volume connection that provides a stable and consistent uptake of the sample. The Self-Aspiration Kit is shown with the TruFlo sample monitor in Figure 6A and with the optional inline filter in Figure 6B. The addition of the inline filter provides a simple and effective way to eliminate the risk of blockages due to particulates in your samples. Even with the inline filter in place there is no restriction in the self-aspiration uptake rate. For more information on the Inline Filter please refer to the [Inline Particle Filter webpage.][4]

The results in Figure 7 show that the IS stability obtained using the Trident and manual addition are indistinguishable when using self-aspiration.

Figure 6. Self-Aspiration Kit

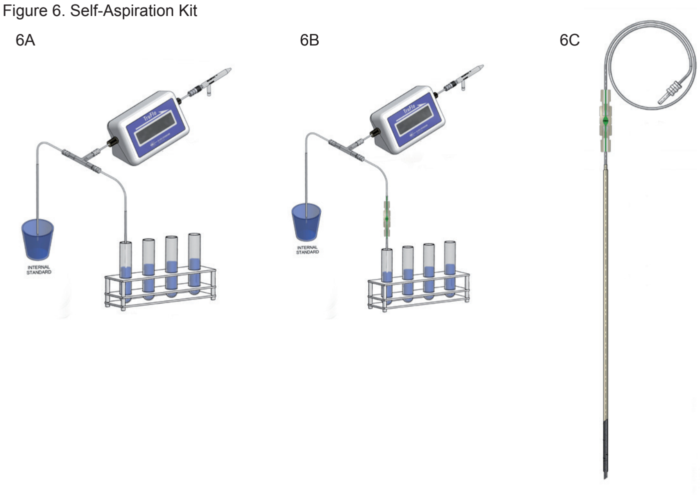
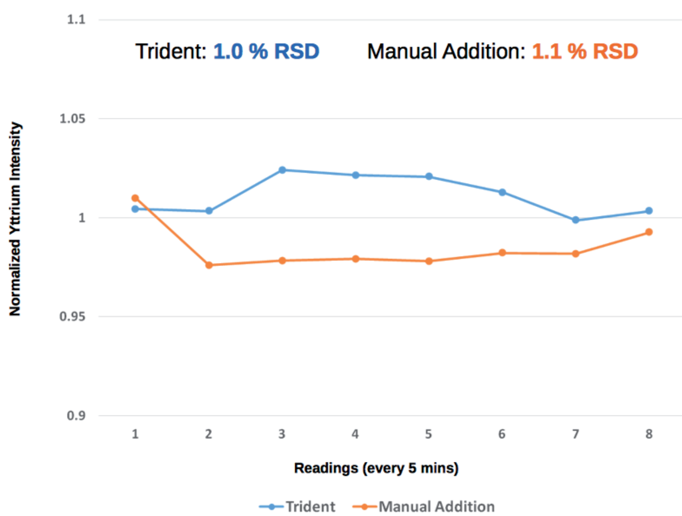


Figure 7. Comparison of Self Aspiration Delivery of the IS – Trident vs. Manual Addition



Conclusions:

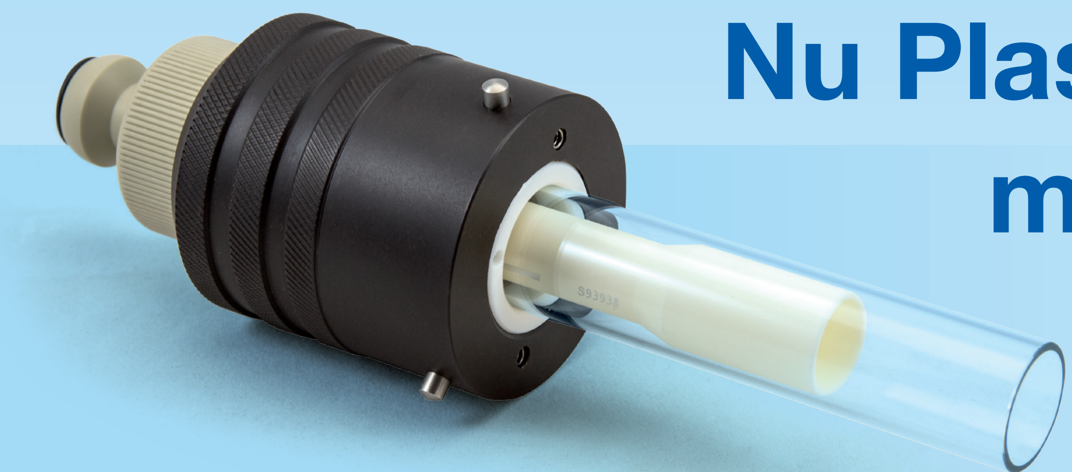
The Trident Inline Reagent Kit provides an ICP analyst with a simple method of accurately dosing each blank, standard, and sample with an internal standard or ionization buffer. The stability and precision of inline addition with the Trident matches the performance of manual addition. Sample preparation time is drastically reduced with the use of inline dilution, in addition to lowering the risk of contamination and error. The TruFlo accessory affords the ICP analyst with a means of monitoring the IS flow rate in real time, ensuring that the Sample:IS ratio is maintained and that the proper tension is applied to the peristaltic pump tubing. A customized Self-Aspiration Kit in combination with the Trident provides the same performance of in-line addition without the need for the peristaltic pump.

References

1. Robert Thomas, “Practical Guide to ICP-MS – A Tutorial for Beginners” 2nd Edition 2008.
2. Glass Expansion October 2004 Newsletter, http://www.geicp.com/site/images/newsletter/GlassExpansionNewsOct04.pdf
3. Glass Expansion TruFlo Real-Time Sample Monitor, http://www.geicp.com/cgi-bin/site/wrapper.pl?c1=Products_accessories_truflo_sample_monitor
4. Glass Expansion Inline Particle Filter, http://www.geicp.com/cgi-bin/site/wrapper.pl?c1=Products_accessories_inline_particle_filter

NEW PRODUCTS

D-Torch for Spectro Arcos II, SpectroBlue and Nu Plasma II models



The D-Torch is a new demountable torch design that provides the benefits of a fully demountable torch at a significantly lower cost. We have previously released the D-Torch for many ICP-OES and ICP-MS models. D-Torches are now also available for the Spectro Arcos II, SpectroBlue and Nu Plasma II models.

The D-Torch is a cost-effective alternative to the standard fixed torch or semi-demountable torch. It will save money for any laboratory with a moderate workload. In most cases, when the torch wears, you will only need to replace the outer tube instead of replacing the entire torch. You will realize a saving after replacing the outer tube three to five times.

Product Number:	Description:
30-808-3600	D-Torch for SpectroBlue EOP
30-808-3629	D-Torch for SpectroBlue TI
30-808-3614	D-Torch for SpectroBlue and Arcos II SOP
30-808-3657	D-Torch for Arcos II EOP
30-808-3496	D-Torch for Nu Plasma II

Click here to see the full D-Torch range.

30-808-3600 - D-Torch Assembly

31-808-3601 - Quartz Outer Tube

31-808-3605 - D-Torch Body

INSTRUMENT NEWS

From Agilent Technologies - New Agilent atomic spectroscopy standards guarantee the highest levels of accuracy, purity, and quality

Agilent's new range of inorganic, metallo-organic and biodiesel Certified Reference Materials (CRMs) are manufactured in an ISO 9001, Guide 34 facility and certified in an ISO/IEC 17025 testing laboratory. This ensures consistent, precise results, for greater productivity. These CRMs are ideal for preparation of calibration or QC standards for ICP-MS, ICP-OES, AA and MP-AES applications. The new range includes a complete line of metallo-organic and biodiesel CRMs, pure base oil and solvent to enable preparation of working standards for analysis of lubricants, wear metals and petroleum products.

Agilent inorganic CRMs are prepared from high purity raw materials, acids, and 18-Mohm de-ionized water, and packed in pre-cleaned, high-purity, HDPE bottles, eliminating contamination. Certification is completed using the NIST HP-ICP-OES method, ensuring high accuracy, low uncertainty and direct traceability to the NIST SRM 3100 series of standards. Each standard includes a Certificate of Analysis confirming certified concentrations and actual impurities. The long shelf life is supported by long-term stability studies performed as part of the requirements for Guide 34 accreditation.

Agilent CRMs can help you achieve precise and accurate calibration data with consistent performance. To learn more about the family of CRMs, download the catalog (Agilent publication 5991-5678EN).

From Analytik Jena - PlasmaQuant® MS Eco Plasma sets a new benchmark in ICP-MS

With the introduction of the PlasmaQuant® MS, Analytik Jena has extended its portfolio with an ICP-MS. The newly developed mass spectrometer with patented solid-state RF generator for plasma generation sets a new industry standard. The highly efficient RF generator produces a robust balanced plasma with an argon consumption rate of less than 10 L/min plasma coolant gas, effectively reducing argon consumption by half compared to conventional ICP-MS in the market. The powerful plasma of the PlasmaQuant® MS is ideal for the analysis of liquid samples, although its strength is shown in the analysis of single particles or dry aerosol. For example, in combination with Laser Ablation sample introduction.

The new Eco Plasma conserves resources and reduces running costs without sacrificing the performance of the ICP-MS.

- Free running 27 MHz solid-state generator
- Neutral plasma for low kinetic energy spread of the analyte ions
- Robust plasma performance with 50% less argon consumption
- Efficient decomposition and ionization of high solid matrices
- Variable plasma power, between 0.3 and 1.6 kW
- Handles organic matrices without changing the torch configuration

From Spectro - Advantages of Simultaneous ICP-OES Elemental Analysis for Cost-Effective Condition Monitoring are Detailed in New White Paper

Spectrometer-based elemental analysis has become a fundamental technique for condition monitoring (CM) in most service laboratories. A new white paper, "Cost-Effective Condition Monitoring," details why a simultaneous ICP-OES instrument is a serious economic alternative to sequential ICP and atomic absorption spectrometry for elemental analysis in condition monitoring.

The paper includes a complete explanation of basic ICP-OES principles and processes — from sample preparation to plasma generator to the optical system and detectors through to the software developed to interpret measurement data. Using the SPECTRO GENESIS simultaneous ICP-OES spectrometer as a test instrument, the paper references the typical limits of detection for related elements in condition monitoring. The paper also describes advantages of the SPECTRO GENESIS' suitability for elemental analysis in condition monitoring and details its cost advantages versus sequential ICP and AAS analyzers.

Download the white paper at http://goo.gl/8JlvFR, from SPECTRO Analytical Instruments, a leading global supplier of analytical instruments for optical emission and X-ray fluorescence spectrometry.