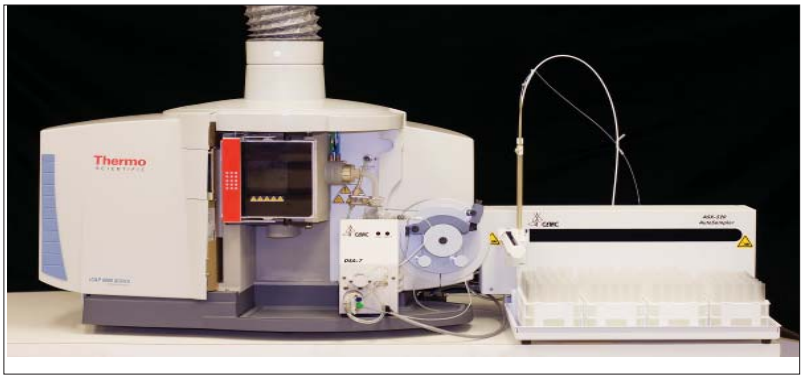
CETAC DSA-7 Discrete Sampling Accessory: Analysis Run Time Comparison for ICP-AES

Introduction:

The time segments required for sample delivery, stabilization and washout are significant parts of the total analysis time. Reducing the duration of these time segments is of particular interest for high throughput laboratories.



Thermo iCAP ICP-AES w. DSA-7 (center) & ASX-520 Autosampler.

The CETAC DSA-7 Discrete Sampling Accessory can significantly reduce the above listed time segments, allowing more rapid sample analysis. The DSA-7 features a high-speed inert vacuum pump for sampling loading and a metal-free six-port injection valve. These features enable much shorter times for sample uptake, injection and washout.

Experiment Description:

Two individual sample runs of 240 samples were performed with and without the DSA-7 with a contemporary ICP-AES instrument. Calibration consisted of a 2% HNO_3 blank and a 1mg/L multi-element standard. The standard was in each of the 240 sample vials. Note that a total of 19 elements were measured, but for graphical clarity only four elements are reported: As, Cu, Pb and Sb.

Experimental Parameters I (with and without DSA-7):

ICP-AES: Thermo 6500 iCAP Dual View
Autosampler: CETAC ASX-520, 4x60 position racks
Sampling Accessory: CETAC DSA-7
Nebulizer: Glass concentric
Spray Chamber: Glass cyclonic
Plasma Gas: 15 L/min
Auxiliary Gas: 0.5 L/min
Nebulizer Gas: 0.65 L/min
ICP Power: 1300 W
View Distance: 15 mm
Plasma View: Dual View
Sample Uptake: 1.8 mL/min
Integration Time: 1 second
Replicates: 3

Experimental Parameters II:

Note much shorter DSA-7 flush and rinse times; DSA-7 sample loop volume of 1.25 mL

Setup	Flush Time (s)	Rinse Time (s)	Loop Load Time (s)
w/o DSA-7	25	35	0
w. DSA-7	5	5	5

Analysis Time:

Setup	Total Run Time
240 Samples w/o DSA-7	7 hours, 38 minutes
240 Samples w. DSA-7	4 hours, 35 minutes

The DSA-7 provides a time savings of 3 hours and 3 minutes, a reduction of analysis time of 40%.

Reproducibility:

The DSA-7 provides concentration reproducibility data that is very comparable to the configuration without the DSA-7. Mean concentration data with %RSDs in ( ) is listed below:

Element (λ)	Conc. (mg/L) w/o DSA-7	Conc. (mg/L) w. DSA-7
As (189.0nm)	1.01 (1.28)	1.00 (1.23)
Cu (224.7nm)	1.01 (0.83)	1.00 (0.96)
Pb (220.3nm)	1.00 (0.87)	1.00 (1.05)
Sb (203.8nm)	1.01 (0.98)	1.00 (1.06)

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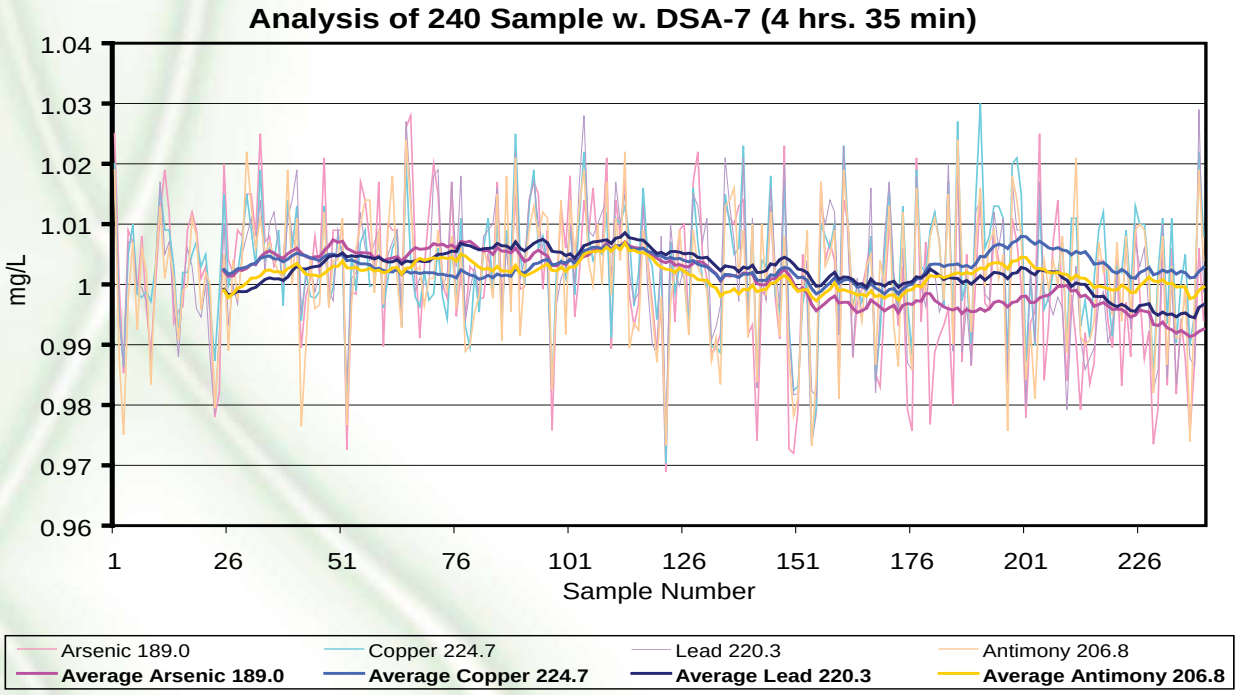
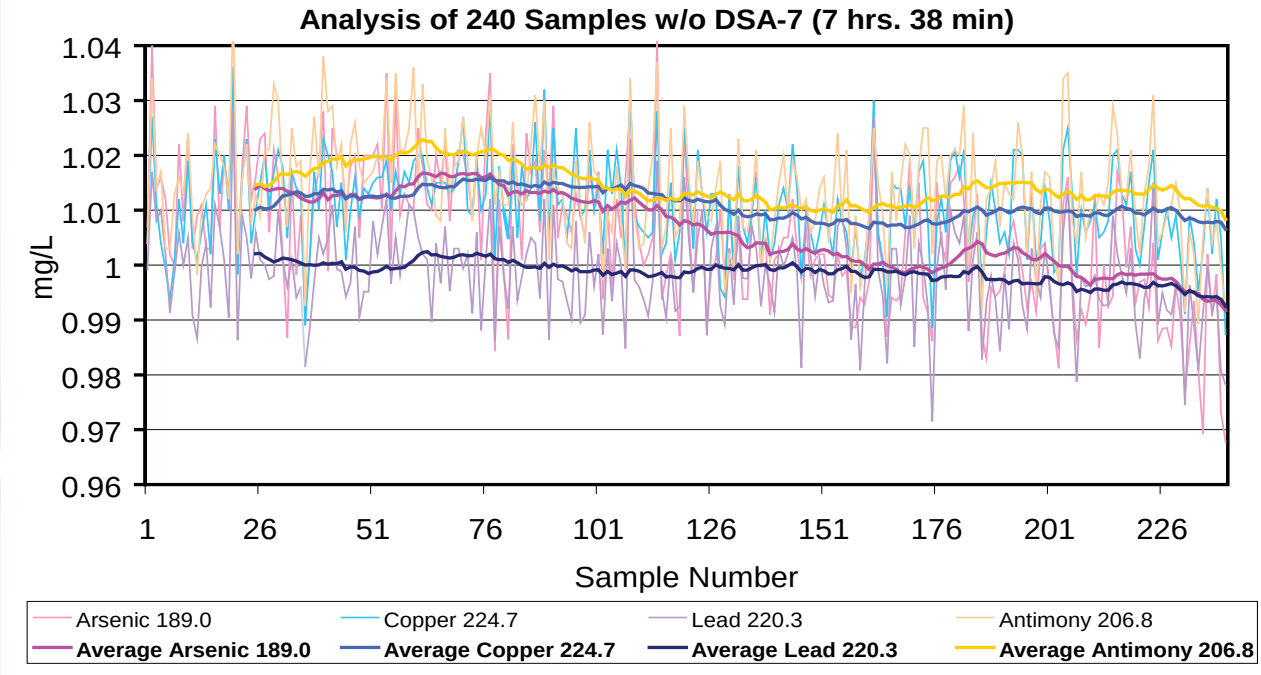
Analysis Trend Charts:

The following two charts show analysis trend lines for As, Cu, Pb and Sb over the period of each 240 sample run. These charts reinforce that there is no significant difference in measured concentration reproducibility with the DSA-7.





Summary:

The CETAC DSA-7 Discrete Sampling Accessory can provide equivalent data quality verus conventional sample introduction with a considerable time savings (40% less time in this experiment). Additional advantages include less sample waste, less exposure of the ICP hardware (torch and viewing optics) to the sample matrix, lower argon gas consumption and no sample memory effects from peristaltic pump tubing.