APPLICATION NOTE

Improve Precision for SIMDIS using 'Light Solvent Optimized' Agilent Model 7693 Automated Liquid Sampler

- **Superior Precision and Recovery data for ASTM D7169 SIMDIS**
- **Improves Injection Performance for Low Boiling Solvents**

Keywords:
SIMDIS, Light Solvent Optimized, CS_2, 7693A ALS, ASTM D7169

INTRODUCTION

There are many factors affecting GC data precision. Sample introduction parameters are amongst the most critical. A factor easily overlooked is the temperature of the sample and its variances over time in relation to the solvent used.
Environmental conditions and heat patterns around the ALS can easily become major contributing factors to performance when very light solvents are used.
In Simulated Distillation analyses, heated zones are typically ramped to temperatures above 430°C, and CS2 (bp: 46.2°) is usually the solvent of choice. Other light solvents with similar boiling point ranges are Pentane, and Dichloromethane may be affected by temperature effects in a similar fashion.
This study shows practical data for Temperatures around the inlet zone vs. repeatability data in a ASTM D7169 dual channel HT-SIMDIS application, and describes an improvement in hardware to superior injection precision.

EXPERIMENTAL

Two Standard Agilent Model 7693 ALS were equipped with sensors to measure temperature profile around the Inlets and ALS on a Dual Channel HighTemp SIMDIS running ASTM D7169. Temperatures were monitored in various locations, including the sample tray.

RESULTS

Initial thermal studies, as shown in Fig 1, demonstrate that temperature around the sample tray area can increase up to 55°, which exceeds the boiling point of CS_2.
Back inlet temperature profiles were always higher compared to front inlets and dual SIMDIS analyzers always demonstrate significant heat dissipation towards the sample area when compared to single channel SIMDIS systems.

These increased temperature levels around the sample area negatively affect injection precision due to selective vaporization of the more volatile solvent in the vial, and vaporization of solvent during the actual sampling process. Both lead to discrimination and variances in injection volume, and in turn may lead to less accurate data on recovery calculations performed for D7169.

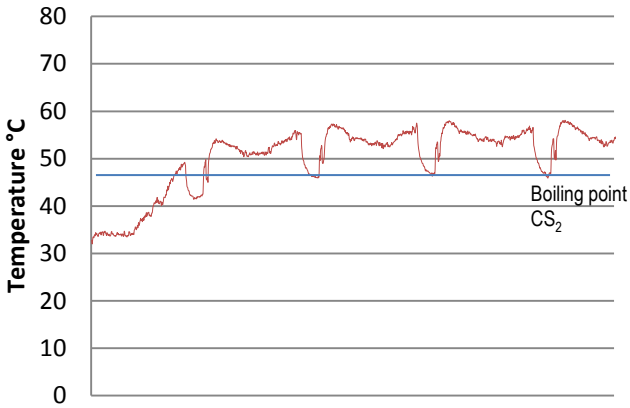

Figure 1: Temperature profile of Rear Tower Sample Tray measured on a dual-channel HighTemp SIMDIS. Temperature measured over several run cycles.

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SOLUTION

The Inlet Fan on the GC was replaced with a higher capacity model, and the 7693 ALS was equiped with an additional fan providing significant vertical airflow, diverting heat away from the sample area.

Figure 2: 7693A ALS Optimized for Light Solvents

Using these changes the temperatures measured in the sample tray dropped significantly. At just above 30°, the temperature was also below the boiling point of the solvent.
Table 3 shows typical repeatability data for the system including both modifications.

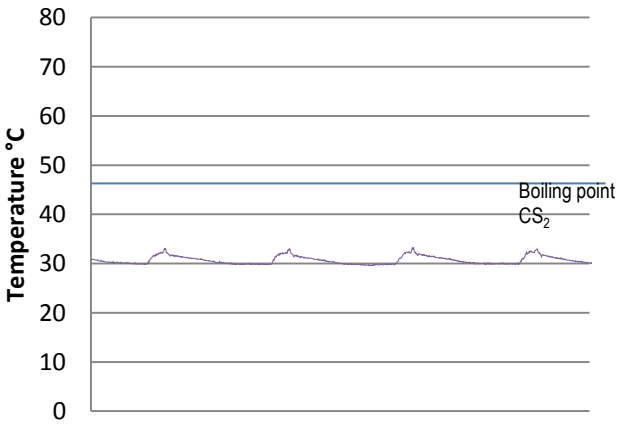

Figure 3: Temperature profile of Rear Tower Sample Tray measured a dual-channel HighTemp SIMDIS equipped with Light Solvent Optimized ALS and modified inlet fan. Temperature measured on Sample Tray over several run cycles .

	Peak Area Front Channel	Peak Area Back Channel
	94663.9	95100.9
	95317.5	95623.0
	95330.9	96279.2
	94348.5	95386.1
	95399.6	96548.0
	95129.8	96336.3
	94929.7	96108.8
	94456.2	96174.6
	95720.1	96794.9
	94765.9	97294.6
	95394	96655.8
	95269.3	97504.5
	94710.4	96308.2
	94873.1	95657.9
	95225.5	96648.2
	95440.9	96683.8
	95873	96446.2
	95382	96632.2
Average	95124	96344
ST DEV	420	615
%	0.4	0.6

Table 1: Typical Peak Area Repeatability Data for Dual SIMDIS with dual Light Solvent Optimized ALS, and modified GC-inlet Fan.

CONCLUSION

The AC “Light Solvent Optimized” 7693 ALS improves thermal profile around the inlet and provides improved SIMDIS repeatability data .

In particular for High Temperature methods such as ASTM D7169, where sample recovery calculation completely depends on accurate and repeatable injections, a better performance directly translates into more accurate product specifications and product value.
It is clear that the “Light Solvent Optimized” 7693 ALS will also provide significant advantage for other types of analyses involving low boiling solvents.

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