

Signal Enhancement and Solvent-Based Interference Reduction for Quad-ICP-MS with the CETAC Aridus II™ Desolvating Nebulizer System

The Aridus II™ Desolvating Nebulizer System is a specialized device for the introduction of low-volume, corrosive (including HF-containing) sample types. This technical note will examine performance of the Aridus II™ with quadruple ICP-MS (no reaction cell) using a substantially lower sample uptake versus a standard nebulizer system. Figures of merit included sensitivity enhancement, signal stability, and oxide reduction (CeO/Ce).

Operating Conditions:

ICP-MS:	PerkinElmer ELAN 9000 (non-DRC)
Power:	1450 W
Nebulizer Gas Flow (Aspire):	0.75 L/min
Nebulizer Gas Flow (Cross-Flow):	0.68 L/min
Cross-Flow Uptake (Pumped):	1.6 mL/min
Cross-Flow Spray Chamber:	Ryton, Cylindrical
Desolvating Nebulizer System:	CETAC Aridus II™
Nebulizer:	CETAC Aspire-200 PFA
Aspire Nebulizer Uptake:	240µL/min
Ar Sweep Gas:	6.00 L/min
N ₂ Additional Gas:	5 mL/min
PFA Spray Chamber Temp:	110°C
Membrane Oven Temp:	160°C

Signal Enhancement:

The Aspire-200 PFA nebulizer was tuned to run at 240 µL/min to provide maximum signal with minimal sample uptake. The standard ICP-MS nebulizer, a pumped cross-flow device, was run at a normal uptake rate of 1.6 mL/min or 6 fold higher. Note that signal with the Aridus II™ is enhanced by a factor of 7 to 12 despite the substantially lower uptake. See Figure 1 below.

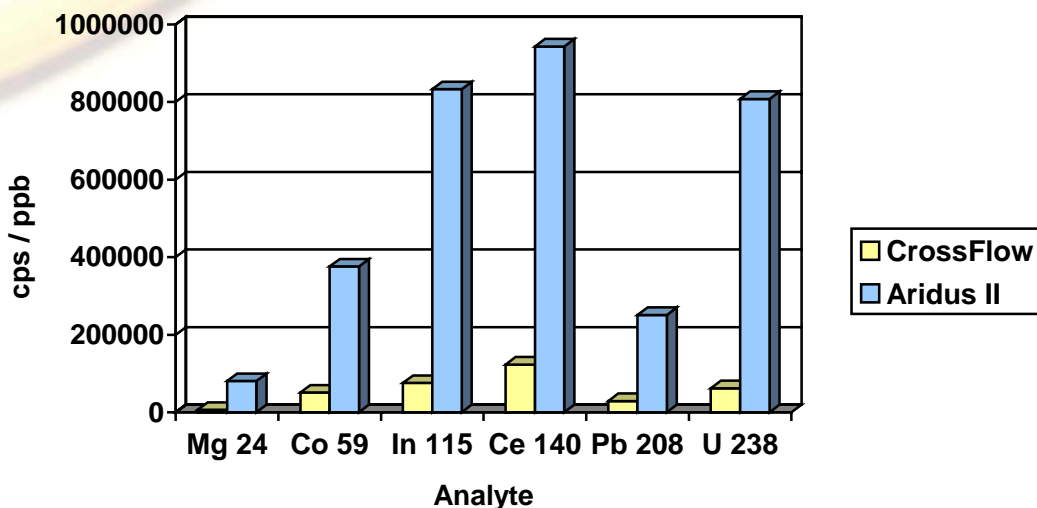


Figure 1. Quad-ICP-MS signal enhancement with Aridus II™



Aridus II™ Desolvating Nebulizer System

Oxide Reduction:

During optimization of the Quad-ICP-MS / Aridus II™ combination, analyte signal is maximized while the cerium oxide (CeO) level is minimized. The nebulizer gas flow and the Ar sweep gas flow (around the membrane desolvator) are the important optimization parameters. The built-in PTFE membrane desolvation unit of the Aridus II™ helps remove most of the water vapor, which is the major source of the CeO. The Aridus II™ can significantly reduce CeO, from a level of 2.9% with the cross-flow nebulizer to 0.032% with membrane desolvation: nearly a factor of 100 reduction. See Figure 2.

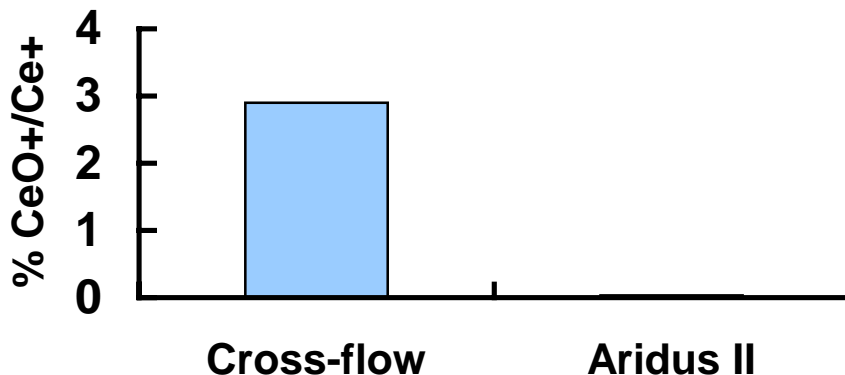


Figure 2. CeO reduction with the Aridus II™

Signal Stability:

As the Aspire-PFA nebulizer is used in a self-aspiration mode, it can exhibit excellent signal stability versus a pumped nebulizer system such as the cross-flow nebulizer. Figure 3 depicts this comparison for a 10-minute run of the six tuning elements. Note that signal stability with the Aridus II™ is at or under 1 % RSD.

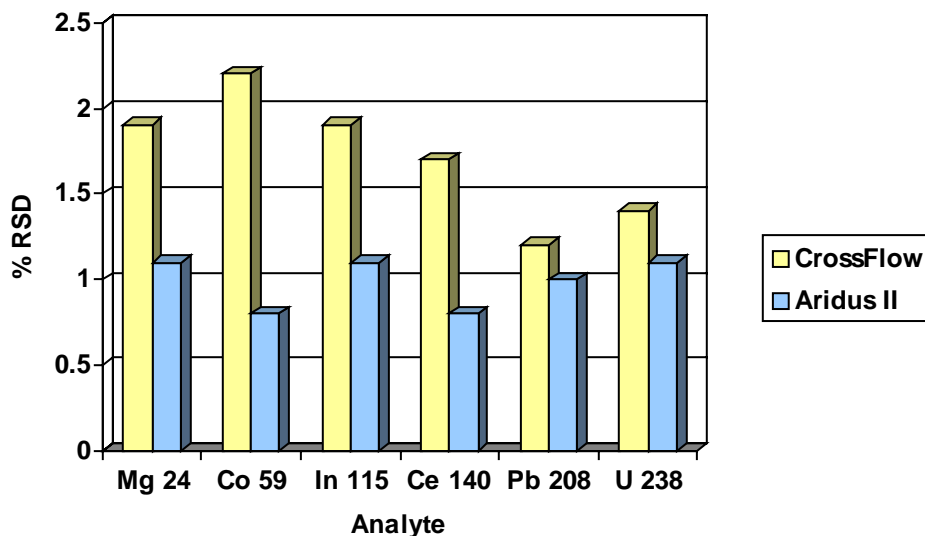


Figure 3. 10-minute signal stability comparison – Aridus II™ vs. CrossFlow

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