

Sensitivity and Stability When Pumping the CETAC Aspire-400 PFA Nebulizer

Due to increasing disposal costs, the generation of liquid sample waste is of growing concern for many laboratories. This technical note will examine the performance of a medium flow (~ 400 $\mu\text{L}/\text{min}$) CETAC Aspire-400 PFA Nebulizer versus a conventional glass concentric nebulizer operating at 1.5 mL/min. In this experiment both nebulizers are pumped to ensure a constant flow rate of sample.

ICP-AES: PerkinElmer Optima 5300 DV:

Parameter	Meinhard TR-50-C1	Aspire-400
ICP Power	1300 W	1300 W
Plasma Gas	15 L/min	15 L/min
Aux. Gas	0.2 L/min	0.2 L/min
Nebulizer Gas	0.80 L/min	0.80 L/min
Uptake Rate	1.5 mL/min	0.40 mL/min
Spray Chamber	Cyclonic	Cyclonic

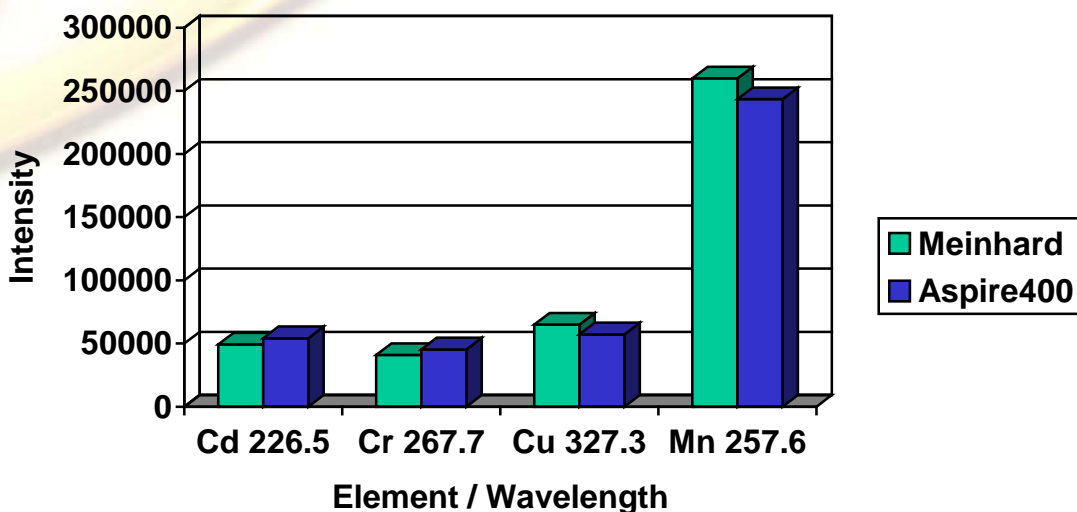
Data Acquisition:

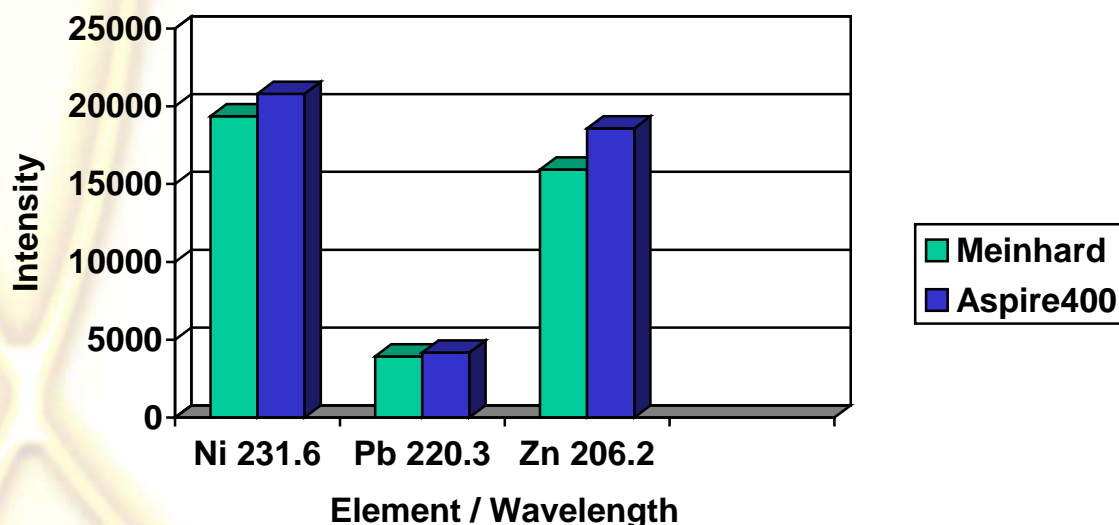
Integration Time:	10 sec
Replicates:	10
Points/Peak	3

Important Note: For the Meinhard nebulizer 0.76 mm i.d. PVC peristaltic pump tubing (black/black color tag) was used. For the Aspire-400 PFA nebulizer, flared-end PVC peristaltic pump tubing (Glass Expansion) was used to allow easy connection to the 1/16 inch o.d. uptake line of the nebulizer. This flared-end tubing is 0.51 mm i.d. (orange/yellow color tag).

Sensitivity Comparison

The figures below show signal intensity comparison for selected elements (Cd, Cr, Cu, Mn, Ni, Pb, Zn) at a concentration of 500 $\mu\text{g}/\text{L}$.





The Aspire-400 provides a very comparable signal to the Meinhard nebulizer, with a range of 88% to 117%. Note that the only difference in operating conditions between the two nebulizers is the uptake rate.

Signal Stability

Signal stability was measured using the blank corrected intensity; stability (as %RSD) is very similar between the two pumped nebulizers.

Element	Wavelength (nm)	Meinhard (%RSD)	Aspire-400 (%RSD)
Cd	226.502	0.45	0.36
Cr	267.716	0.42	0.33
Cu	327.393	0.42	0.30
Mn	257.610	0.42	0.32
Ni	231.604	0.52	0.55
Pb	220.353	0.66	0.65
Zn	206.200	0.48	0.49

Summary:

A medium flow (~400 μ L/min uptake) nebulizer can provide comparable sensitivity and stability versus a conventional higher flow (1.5 mL/min) nebulizer while generating 70% less sample waste. Pumping the Aspire-400 PFA nebulizer at a fixed flow rate is easily accomplished with flared-end peristaltic pump tubing.