



Typical Performance Characteristics of the CETAC MCN 100 Micro Concentric Nebulizer

CETAC MCN 100 with ICP-MS

Problem: Conventional pneumatic nebulization systems used with ICP-MS have a number of disadvantages. Principally they are inefficient, in that they produce more wasteful aerosol than that which is analytical useful. Hence, sample consumption is greater than is actually necessary and solvent loading in the ICP can be unacceptably high.

Solution: The unique microconcentric nebulizer MCN-100 from CETAC is a highly efficient, precision pneumatic nebulizer. The quantity of analytically useful aerosol produced is extremely high; hence sample is used more optimally.

Benefits:

- w Low sample consumption at 10-100 uL/min.
- w Excellent tolerance of dissolved solids.
- w Totally inert construction.
- w Excellent performance with a wide range of reagents.
- w Completely HF resistant.
- w Does not require high-pressure gas lines.

Performance: The design of the MCN-100 facilitates optimum sample consumption at around 30uL/min. The nebulizer can also operate at even lower flows with good analytical performance. Figure 1 illustrates the flow / signal relationship for four elements. The device will operate at even lower flows if required. Note that in this case the signal was optimized at 5uL/min. The sample consumption is so efficient that very little solution runs to waste, most of the sample being carried to the ICP. A further advantage of this is that the excess water in the ICP, originating from large droplets is reduced and oxide levels are lower as seen on Table1.

CeO ⁺ / Ce ⁺	0.28%
Ce ²⁺ / Ce ⁺	2.2%

Table 1. Oxide and doubly charged performance with MCN-100.

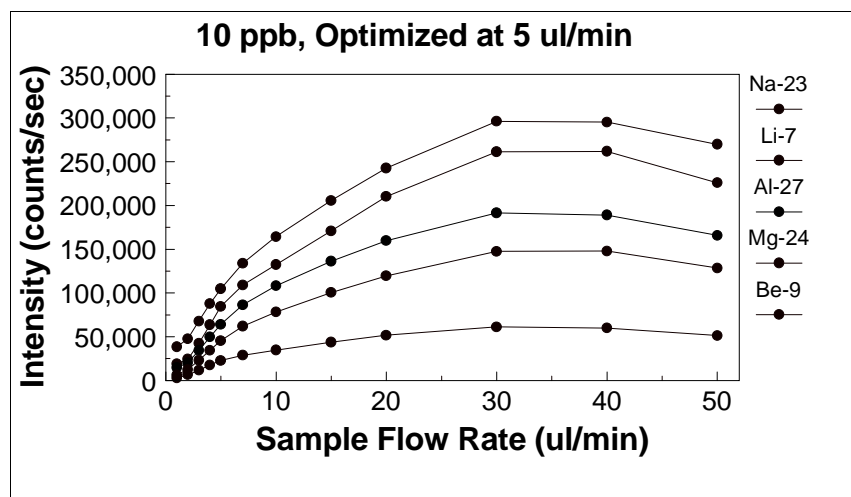


Figure 1. Flow rate/ signal response functions for MCN-100.

The MCN-100 is made of acid resistant materials, and is compatible with aggressive matrices such as HF and H₂SO₄ etc. Signal response in such matrices is excellent as shown on Figure 2 for acid levels up to 20%HF. The lack of suppression at these high HF concentrations is due in part to the more uniform aerosol production of the MCN-100. When much more viscous reagents such as H₂SO₄ are run, the precision is so good that internal standardization can easily correct for transport effects as shown on Figure 3.

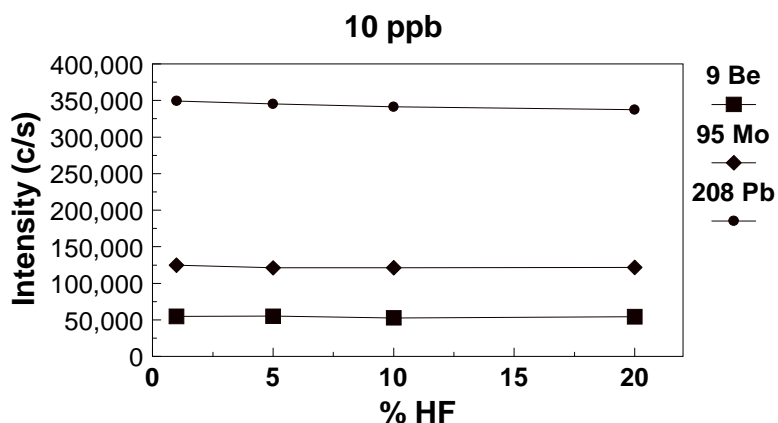


Figure 2. Effect of HF on signal response with MCN-100.

One of the most important parameters in ICP-MS is signal stability, especially in a heavy matrix. Data is given on Table 2 illustrating stability in a seawater matrix over 10 hours.

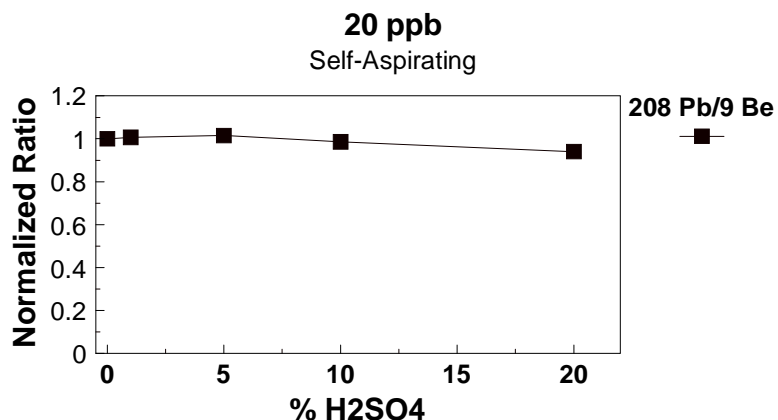


Figure 3. Correction of H₂SO₄ viscosity effects with internal standardization.

<u>Element</u>	<u>%RSD</u> <u>over 10</u> <u>hrs</u>	<u>%</u> <u>Recovery</u> <u>@ 50ug/L</u>
Al	4.1	96.5
V	2.9	96.9
Cr	7.6	100.7
Mn	8	82
Co	6.2	77.5
Cu	11	80.2
As	6.2	93
Mo	3.1	102.3
Ag	2.1	96.7
Cd	3.9	90.3
Sb	4.1	104.4
Ba	1.9	106.8
Pb	6.7	112.3
Th	6.8	107.2
U	6.5	107.6

Table 2. MCN-100 long-term (10 hour) stability data and recoveries for seawater matrix.

Conclusions: The MCN-100 is extremely efficient at producing aerosol for ICP-MS. It will operate at very low flow rates often below 30uL/min with no degradation in performance compared with more conventional pneumatic nebulizers. Aggressive reagents are handled easily as are higher salt content samples, making it an ideal sampling device many routine applications.

Note: This application note illustrates performance trends when using the MCN-100. Actual analytical values will of course depend on the instrumental system in use