U6000AT+ Technical Note

Signal Enhancement and Interference Reduction for Quadrupole ICP-MS

The CETAC U6000AT+ Ultrasonic Nebulizer / Membrane Desolvator offers a number of advantages as a sample introduction accessory for quadrupole ICP-MS. These advantages include analyte signal enhancement and the reduction of unresolved solvent-based interferences that compromise the detection of important elements. Setup of the U6000AT+ with an ICP-MS instrument is easy and normal ICP power levels are maintained.

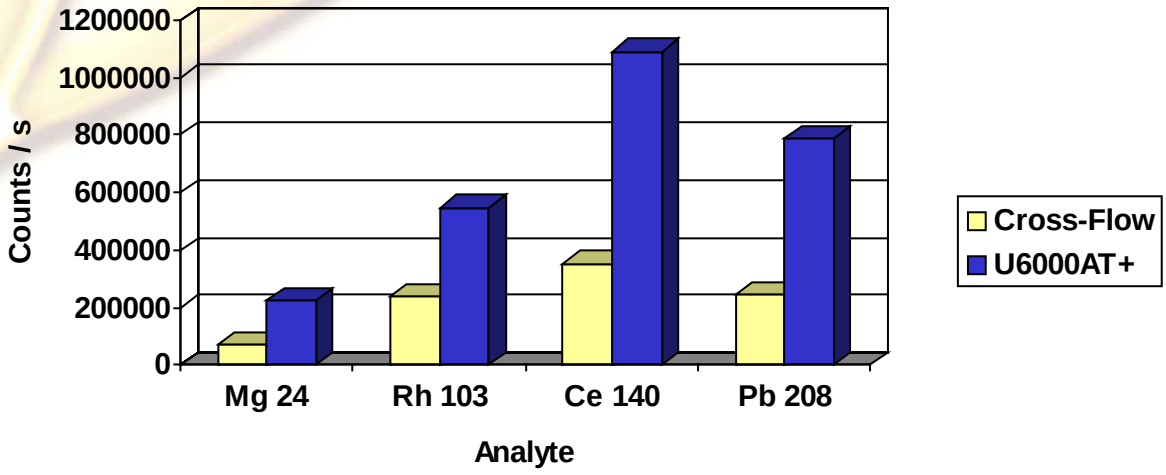
Operating Conditions

ICP-MS: PerkinElmer ELAN 9000
Power: 1300 W
Nebulizer gas flow: 0.7 L/min
Sample uptake: 2.0 mL/min

CETAC U6000AT+:
Heater temp: 140°C
Cooler temp: 3°C
Membrane oven temp: 160°C
Sweep gas flow: 2.00 L/min

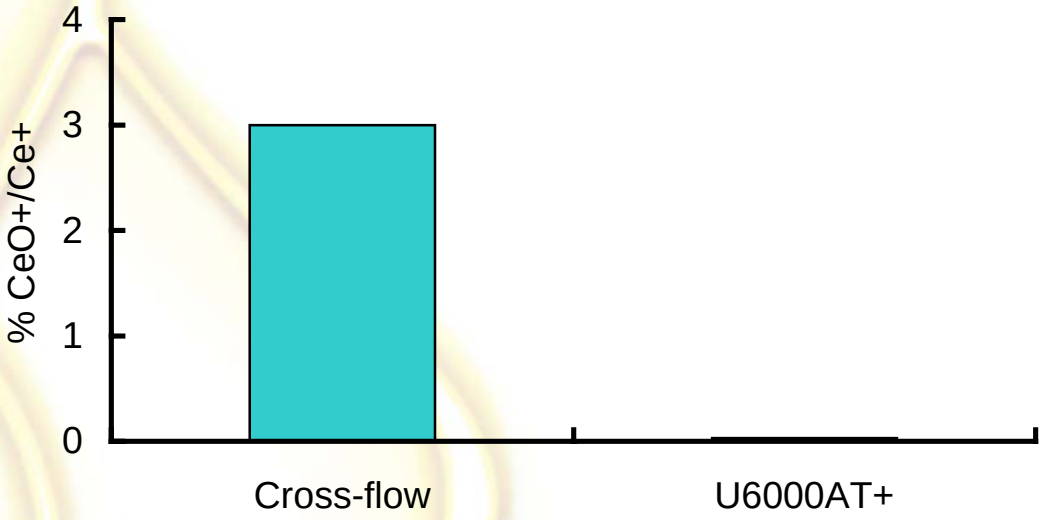
Signal Enhancement

ICP-MS signal enhancement with the U6000AT+ may be up to a factor of 3 or higher versus a standard pneumatic nebulizer. The following chart compares U6000AT+ sensitivity with a cross-flow pneumatic nebulizer for 4 common ICP-MS tuning elements: Mg, Rh, Ce, and Pb.



Interference Reduction

The membrane desolvator of the U6000AT+ can dramatically decrease solvent-based interferences in ICP-MS. One example is the reduction in cerium oxide (CeO) as the membrane desolvator removes most of the water vapor from the sample aerosol (a reduction from 2.7% CeO/Ce to 0.04% CeO/Ce as depicted below).



Two other examples of solvent-based interferences in ICP-MS are $^{38}ArH^+$ on $^{39}K^+$ and $^{40}ArO^+$ on $^{56}Fe^+$. As shown in the table below, the U6000AT+ can greatly reduce these species, allowing low level detection of K and Fe under normal ICP-MS conditions (lower detection would be possible under clean room conditions). Blanks and standards were prepared in 0.1% high-purity HNO_3.

Interference	m/z	Crossflow (cps)	U6000AT+(cps)	Reduction Factor	Detection Limit
ArH^+	39	243,000	8400	30	10 ppt ^{39}K
ArO^+	56	>2.0 x 10^6	5140	>390	8 ppt ^{56}Fe