

U5000AT+ Technical Note

Enhanced Trace Element Detection for Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES) with Ultrasonic Nebulization

Introduction

ICP-OES instruments can provide laboratories with rapid trace level detection (ppb and sub-ppb) for most elements. However, more stringent regulatory requirements have lowered detection limits for difficult to detect elements such as arsenic.

The coupling of an advanced radial-viewing ICP-OES instrument with an ultrasonic nebulizer (USN) can help lower detection limits by up to a factor of 7. This technical note will list the improvement of these limits for this particular ICP-OES instrument.



CETAC U5000AT+ Ultrasonic Nebulizer



U5000AT+ Aerosol

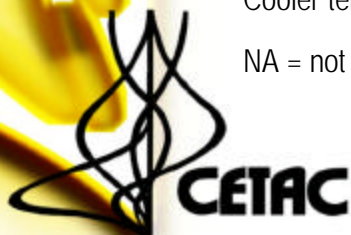
Equipment

ICP-OES Instrument: JY Horiba Ultima 2 (with standard pneumatic nebulizer)
Ultrasonic Nebulizer: CETAC U5000AT+

Operating Conditions

	Glass Concentric Nebulizer	U5000AT+ USN
ICP Power	1000 W	900 W
Plasma gas flow	12 L/min	12 L/min
Auxiliary gas flow	0 L/min	0 L/min
Sheath gas flow	0.2 L/min	0.2 L/min
Nebulizer gas pressure	3 bar	1 bar
Sample uptake rate	1 mL/min	1 to 2 mL/min
Heater temperature	NA	140°C
Cooler temperature	NA	3°C

NA = not applicable



Detection Limits

Detection limits are based on 3x the standard deviation of the blank concentration; sample integration time was typically 5 to 8 seconds. Concentration units are given as $\mu\text{g/L}$ (ppb).

Element	λ (nm)	Concentric Nebulizer	U5000AT+ USN	Improvement Factor
Ag	328.068	0.60	0.1	6
Al	167.081	0.20	0.03	6
As	189.042	1.5	0.2	7
Ba	233.527	0.04	0.01	4
Be	313.042	0.04	0.006	6
Cd	214.438	0.15	0.02	7
Co	228.616	0.2	0.06	3
Cr	267.716	0.2	0.06	3
Cu	324.754	0.2	0.05	4
Fe	259.940	0.20	0.05	4
K	766.490	1.5	0.3	5
Li	670.784	0.50	0.1	5
Mn	257.610	0.05	0.01	5
Mo	202.030	0.20	0.1	2
Na	589.592	0.60	0.15	4
Ni	221.647	0.30	0.06	5
P	177.495	1.5	0.3	5
Pb	220.353	1.5	0.2	7
Sb	206.833	1.5	0.2	7
Se	196.026	1.5	0.2	7
Ti	334.941	0.15	0.03	5
Tl	190.838	1.0	0.2	5
V	311.071	0.20	0.05	4
Zn	213.856	0.15	0.03	5



