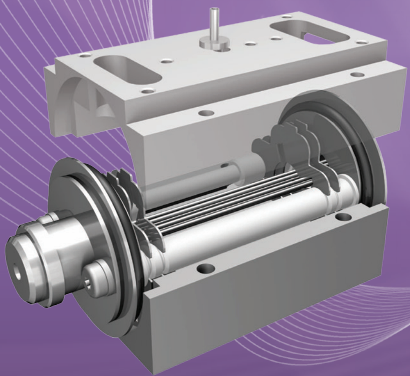

Agilent 7800 Quadrupole ICP-MS

ENHANCED HELIUM MODE CELL PERFORMANCE FOR IMPROVED INTERFERENCE REMOVAL IN ICP-MS

Helium collision mode in ICP-MS

Helium (He) mode with kinetic energy discrimination (KED) is the preferred mode for effective and reliable removal of mulitple polyatomic interferences in CRC (collision/reaction cell) ICP-MS. While reactive cell gases may be very effective at removing individual interferences from individual analyte isotopes, they are unable to simultaneously remove all the interferences in real-world applications, where the sample composition is often unknown, complex, or variable.

However, a few elements still needed reactive cell gases for the best detection limits. A good example is the low-level analysis of Se, where a reactive gas (typically H_2) was required to give single ng/L (ppt) detection limits.

Enhanced helium mode performance in the ORS^4

- Longer, higher-frequency octopole significantly increases collision rate
- Higher cell gas flow rates give increased cell gas pressure
- New ion lens gives higher bias voltage and greater collision energy
- New gas controller reduces cell gas switching time

Enhanced He mode performance in the ORS^4

The 4th generation Octopole Reaction System (ORS^4) used in the Agilent 7800 ICP-MS significantly improves interference removal performance in He mode, see highlights, left.

The combined effects of these enhancements is that the ORS^4 provides a much smaller overlap between the residual energies of the analyte ions and the interfering ions, so KED at the cell exit delivers more effective separation of the analyte from the polyatomic interferences.

	Ecm (1st collision) [eV]
Ar_2 bond dissociation energy	1.33 eV
Normal collision (Ei = 20 eV)	0.98 (<1.33)
ORS[4] collision (Ei = 100 eV)	4.88 (>1.33)

Table 1. Center-of-mass collision energy (Ecm) at normal and ORS[4] ion energies, leading to collision induced dissociation (CID) with ORS[4].

An additional benefit of ORS[4] He mode on the 7800 ICP-MS is that the higher collision energy provides collisional dissociation of some polyatomic ions, as the energy of the polyatomic ion's collision with the cell gas is higher than its bond energy.

Again, the Ar_2 interference on Se is a good example, as shown in Table 1, where the collision energy of Ar_2 in the ORS[4] (4.88 eV) is higher than the bond dissociation energy of Ar_2 (1.33 eV).

The combination of collisional dissociation and the enhanced separation of residual kinetic energy means that the background equivalent concentration (BEC) for ^{78}Se is significantly reduced (to around 2 ng/L (ppt)) with the ORS[4], as shown in Figure 1.

The He mode performance available with the ORS[4] is remarkable, as illustrated for Se, where the detection limit is improved from about 150 ppt (ORS[2]) to <5 ppt (ORS[4] – Figure 2). Detection limits for S, P, and Fe are also improved with ORS[4], eliminating the need for reactive cell gases in many applications.

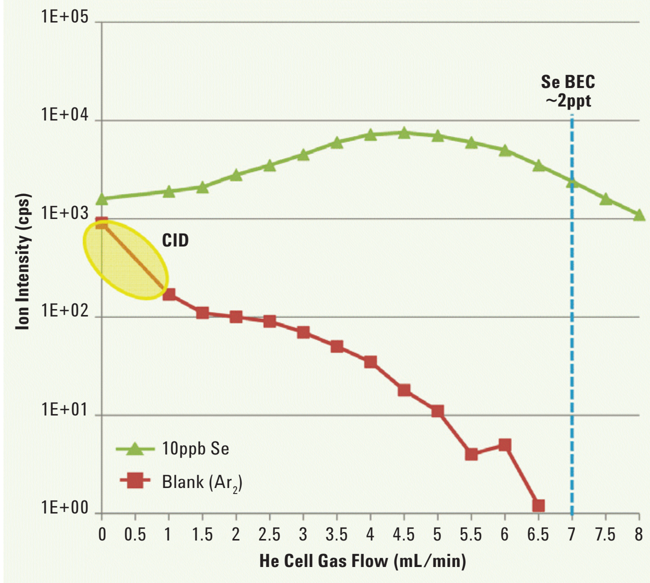

Figure 1. He cell gas optimization plot, showing Ar_2 dissociation (CID).

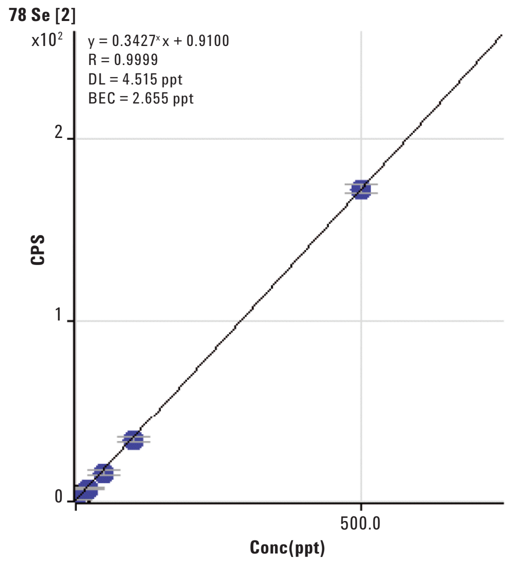

Figure 2. Calibration for ^{78}Se in ORS[4] He mode (DL 4.5 ppt, BEC 2.7 ppt)

For more information visit:
www.agilent.com/chem/7800icpms

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