Maximizing ICP-MS Productivity for High Matrix Samples Using the 7700x with ISIS Discrete Sampling

High Productivity Analysis of High Matrix Samples

Maximum productivity requires more than just fast analysis times; it also requires the robustness and stability to maintain high speed analysis for an extended period. The typical ICP-MS interface is designed to tolerate samples containing up to 0.2% total dissolved solids (TDS). Above this level, the plasma may become overloaded, leading to:

- Signal drift caused by gradual deposition of undissociated material on the interface cones
- Higher levels of polyatomic interferences (such as strongly-bound matrix oxides)
- Increased suppression (signal loss), especially for poorly ionized analytes such as Be, B, Zn, As, Se, Cd and Hg

The Agilent 7700x ICP-MS was designed to alleviate these problems by increasing the matrix tolerance of the plasma, as well as enhancing the performance of the 3rd generation Octopole Reaction System (ORS^3) cell operating in helium collision mode (He mode).

Agilent High Matrix Introduction (HMI) System

The 7700x includes the unique HMI system which dilutes the aerosol stream from the spray chamber, thereby reducing the aerosol and matrix loading on the plasma. The result is a significant increase in the effective plasma temperature, which effectively eliminates matrix suppression, and also allows samples containing % levels of TDS to be analyzed routinely, without the need for time consuming dilutions of over-range samples.

Helium Collision Mode

He mode on the ORS^3 cell is widely acknowledged as the most effective and reliable method for removing the unknown and variable polyatomic interferences typically seen in complex natural samples. Since He mode works for any polyatomic interference, it provides significantly shorter run times compared to reaction cell methods, where multiple cell gases are typically required to address all the interferences that occur in complex samples.

Integrated Sample Introduction System (ISIS)

Achieving the highest productivity in ICP-MS requires optimization of the sample uptake and washout steps, which account for more than half of the overall run time in a typical ICP-MS method. The ISIS option for the 7700 Series can be configured for maximum productivity using Discrete Sampling or DS which, while much faster than conventional sample introduction, still allows multiple replicates to be measured from each sample injection as required by USEPA methods.

The Result

A standard Agilent 7700x ICP-MS fitted with an optional ISIS-DS system was used for the measurement of a sequence of high matrix standard reference materials, 1/10 diluted seawaters, and all EPA 6020A required QA/QC samples. 275 analyses were performed in 8 hours 8 minutes, with an average run to run time of 1.99 minutes per sample. Excellent internal standard stability (Figure 1) is evidence of superior matrix tolerance and long term stability.

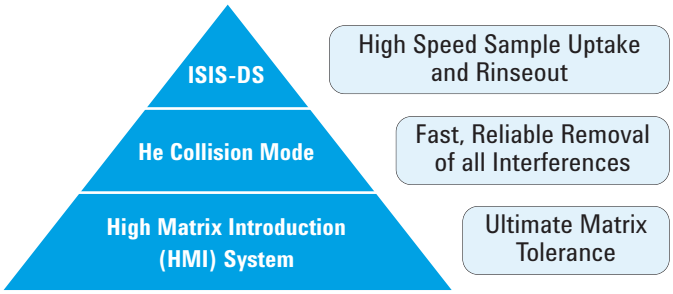

Figure 2. The key components of high productivity

Combined ICP-MS Technologies for High Matrix Sample Analysis

The unique combination of ISIS-DS, HMI and He mode for universal interference removal delivers much faster analysis, while also providing effective removal of polyatomic interferences, and the highest matrix tolerance of any ICP-MS – Figure 2.

For more information on the 7700x visit the Agilent Technologies web site at: **www.agilent.com/chem/icpms**

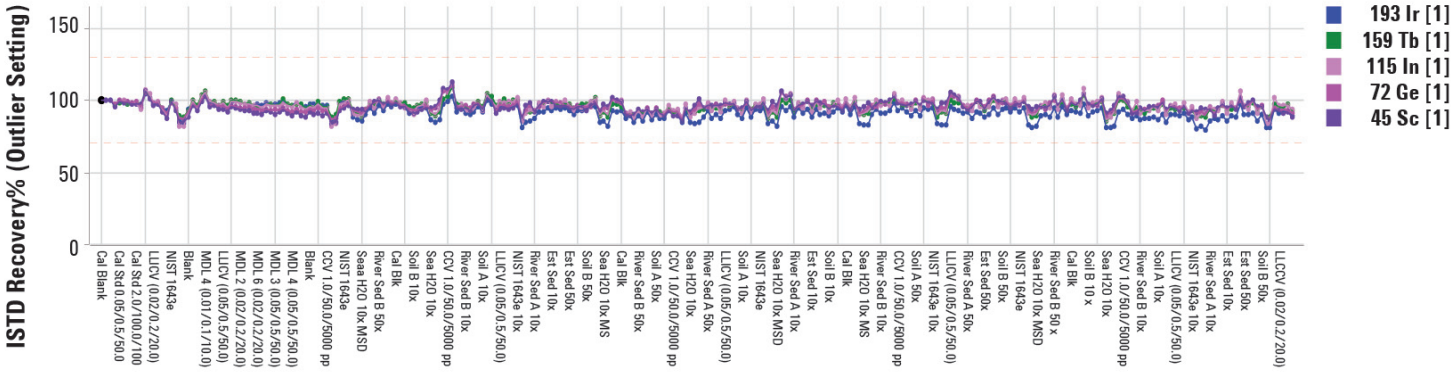

Figure 1. Minimal Internal Standard signal drift for sequence of 275 high matrix environmental samples (not all sample names are shown)

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