Case study | 003716

Trace elemental analysis

Pushing the limits for trace elemental analysis using triple quadrupole ICP-MS

Ultra Trace Analysis Aquitaine (UT2A) was formed in 1999 as a spin-off laboratory from the University of Pau, France, and is today a renowned independent technology center dedicated to inorganic analysis. The team's mission is to help their clients fully understand the elemental content of their samples—not just supporting them by performing analyses but also helping established laboratories develop and fully optimize existing methods, up to the generation of ready to implement SOPs. UT2A collaborates with customers from all industries and analyzes a wide range of samples, including waters, foods, pharmaceuticals, and polymers. UT2A also provides solutions to test established methods for evaluation of performance.

Jean Dumont is an application engineer with a background in elemental speciation who is now managing the routine analysis performed in the laboratory. He joined UT2A in 2003 as one of the first of what is now a team of 11 technical experts and lab technicians in the field of elemental analysis. *"The first ICP-MS I used did not yet have a collision cell, so we had to be very careful with interferences,"* says Jean. He adds, *"For us, it is also very important to include sample preparation into our considerations as it is vital to get complete digestions and also to decrease detetction limits due to backgrounds."*

UT2A received a Thermo Scientific™ iCAP™ MTX ICP-MS in their lab and have used it intensively and in full production over a period of 10 months. This was possible as the system was fully qualified using IQ/OQ. The instrument was usually operated twice per week, and on each day of operation, approximately 200 samples were run, including all blanks, standards, and QC checks.

> "If a customer were to ask me for my opinion on the iCAP MTX ICP-MS, I would say to do it."
>
> –Jean Dumont, Application Engineer, Ultra Trace Analysis Aquitaine

UT2A Ultra Traces Analyses Aquitaine

thermo scientific

> "Qtegra software is easy to understand, even for new users."
> –Jean Dumont, UT2A

One sample that particularly benefitted from the novel technology within the iCAP MTX ICP-MS was an aqueous medical solution containing g·L^{-1} of NaCl but requiring a quite stringent quantification limit of 1 µg·L^{-1} for iron. Considering the 1:10 dilution, this means that the instrument needs to reliably detect 0.1 µg·L^{-1}. *"That was easily possible thanks to the great sensitivity of the instrument in KED (Kinetic Energy Discrimination) mode,"* says Jean. This can be easily complemented by using reactive gases and triple quadrupole technology for advanced interference removal when needed. One example was a request to analyze selenium in a product that contains high levels of gadolinium, creating an interference through doubly charged ions.

Running such samples with only a light dilution upfront usually means a lot of maintenance on conventional ICP-MS systems, as salt deposits may clog nebulizers or contaminate the interface area of an ICP-MS. Ultimately, such effects lead to drifts and QC failures, as well as declining sensitivity over time. The Thermo Scientific™ iCAP™ MX Series ICP-MS instruments come with a redesigned sample introduction system and interface, greatly reducing such unwanted matrix effects. While the new interface design significantly reduces deposition during sample analysis, intelligent Matrix Handling (or iMH) helps to further reduce exposure of the instrument during non-productive analysis times (i.e., sample uptake and wash). Samples containing even higher amounts of total dissolved solids (TDS) can be diluted automatically using argon gas directly in the instrument with the new Easy Argon Gas Dilution (Easy AGD).

"We have used the matrix interface for this kind of analysis, and there was no deposition visible on the interface. No issues pointing towards an issue with cones, not even with undiluted seawater," states Jean. If the interface needs to be cleaned, the easy access makes this a simple procedure, also for the sample introduction system. *"In case we're asked to really push the quantification limits, it is also great to be able to easily access the extraction lens on the backside of the interface,"* says Jean. Compared to other instruments, the frequency of maintenance could be reduced. *"I explained to my technicians earlier that you have to clean cones every time you use the instrument. However, with the iCAP MTX ICP-MS, we only cleaned the cones for really pushing the quantification limits—most of the time, it was not required and certainly not done as frequently as before."*

For laboratories where operators are switching between different applications and instruments, software is a key element to success. Thermo Scientific™ Qtegra™ Intelligent Scientific Data Solution (ISDS) Software is a strong asset. *"I have used former versions of Qtegra software, and I am now happy with all functions integrated into a single graphical user interface. Qtegra software is easy to understand, even for new users."* Qtegra ISDS software allows users to define specific settings for each analyte, including different resolution settings on both quadrupoles. In addition, it comes with a series of useful tools supporting the efficiency of the laboratory, for example the Thermo Scientific™ Hawk™ Consumables and Maintenance Assistant, as well as the built-in feature set for Quality Control monitoring. *"We have created a custom alert to remind us to perform a detector set up and cross calibration regularly—for us, this is a key step in gathering the best data,"* says Jean.

Based on the experience with the system, Jean Dumont is very happy with the iCAP MTX ICP-MS. *"One thing I did not particularly like with previous generations of instruments was the peristaltic pump, but with the new EasyClick design, this is now eliminated. Sometimes tubings were changed just because of the schedule, not because they were worn out."*

All in all, the addition of the iCAP MTX ICP-MS has left a strong impression in the laboratory. *"If a customer were to ask me for my opinion on the iCAP MTX ICP-MS, I would say to do it,"* concludes Jean.

Learn more at **thermofisher.com/icp-ms**