New Agilent GC-ICP-MS Interface

Fully Heated Interface for the Agilent 7890 GC & 7700 ICP-MS Allows Routine Analysis of High Boiling-Point Compounds

Gas Chromatography

Gas chromatography (GC) is a widely used technique for the separation and detection of volatile organic compounds in various applications and industries. Many GC detectors are available, including element-specific detectors such as PFPD/FPD ((pulsed) flame photometric detector) or SCD (sulfur chemiluminescence detector) for sulfur, NPD (nitrogen/phosphorus detector) for nitrogen or phosphorus, and ECD (electron capture detector) for the halogens. GC is also routinely combined with a mass spectrometer or mass selective detector (MS or MSD), notably a single quadrupole or triple-quad (QQQ). However, none of these detectors is capable of providing universal, element specific quantification.

GC-ICP-MS

ICP-MS offers a unique combination of rapid multi-element/isotope analysis, very low detection limits, wide dynamic range and good matrix tolerance. Many of these attributes also apply when ICP-MS is used as a detector for GC. ICP-MS also provides equivalent or better sensitivity, selectivity and specificity compared to the element-specific GC detectors mentioned above, due to the high-temperature plasma ion source. The ICP-MS plasma is designed to tolerate a high level of sample aerosol suspended in the carrier gas, so an excess of energy is available when a dry GC carrier gas is introduced. The combination of plasma robustness, detector linearity, and element selectivity places GC-ICP-MS in a unique position to address several critical applications, especially in the environmental, food safety, petrochemical and chemical industries.

The first commercial GC-ICP-MS interface was developed by Agilent Technologies in 2002, and this became the benchmark for GC-ICP-MS performance, due to its fully heated transfer line and torch injector, which permit the analysis of high boiling-point (BP) compounds. These innovations, which remain unique, have been enhanced and refined in the new GC interface developed for the 7700 Series ICP-MS (Figure 1).

The new Agilent GC-ICP-MS interface has the following features:

- Reduced length, simpler installation and more consistent alignment than the previous model
- Maximum temperature of 300°C, allowing high BP compounds to be quantitatively transferred to the detector
- Sulfinert® interface liner for passive transfer from the GC column to the injector tip, permitting the analysis of reactive compounds, such as many sulfur species
- Argon make-up gas pre-heat in the GC oven maintains gas temperature at compound elution temperature
- Electronic Pressure Control Module (PCM) for optional gases (such as oxygen to decompose carbon)

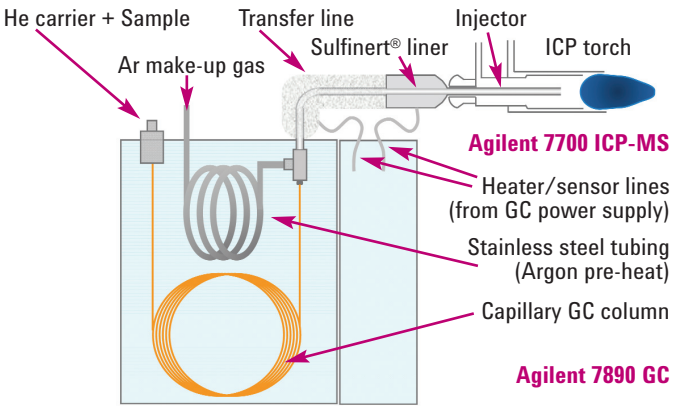

Figure 1. Agilent GC-ICP-MS interface for the 7890 GC/7700 ICP-MS

GC-ICP-MS Applications

The new Agilent GC-ICP-MS interface performs exceptionally well across a wide range of applications from simple tasks such as organo-tin and methyl mercury in marine environment and food samples to much more demanding applications. The fully-heated, fully inert interface offers unmatched performance in challenging applications such as sulfur or mercury speciation in petrochemicals, siloxane analysis in biogas and the measurement of brominated flame retardants including polybrominated diphenyl ethers (PBDEs), illustrated in Figure 2.

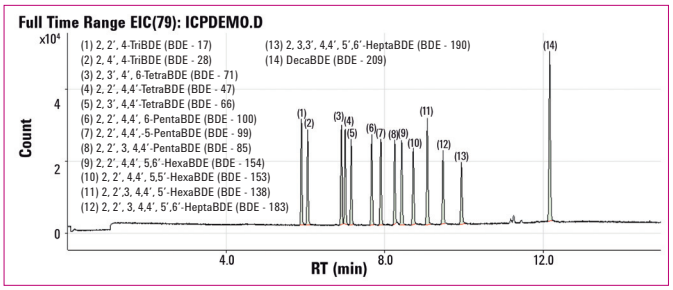

Figure 2. GC-ICP-MS chromatogram of mixed PBDE standard; 25 ppb each compound except #138 (37.5 ppb) and #209 (100 ppb)

Figure 2 shows the GC-ICP-MS chromatogram of a commercial PBDE mix (CILPBDE Predominant Congener Mixture EO-5103) containing 14 different PBDEs. All the PBDEs were separated easily using the new GC-ICP-MS interface, and good sensitivity was maintained even for the difficult #209 (decaBDE) congener, which is thermally labile and decomposes easily during GC separation. This application illustrates one of the many performance benefits of the new interface.

Analysis of Unusual Elements

The use of GC for ICP-MS sample introduction provides some unique benefits for elements which are not commonly measured by ICP-MS. The use of a dry GC carrier gas and a fully heated GC interface eliminates most polyatomic interferences and gives access to several elements which are difficult or impossible to measure by ICP-MS with conventional solution nebulization. These elements include S, P, Cl and even C, all of which can be useful or essential analytes for the measurement of compounds such as pesticide residues in food and environmental samples.

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

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