Elimination of system relevant PFAS with Bruker's PFAS kit

Per- and polyfluoroalkyl substances (PFAS) are a group of about 4700 industrial chemicals that have a widespread use. Due to their hydrophobic and lipophobic properties, PFAS compounds are known to persist and accumulate in the environment.

Introduction

Accurate and comprehensive screening for the ever-growing number of PFAS is challenged by many factors, including contamination of samples, instruments, or chemicals. This can be problematic for analysis in the trace range, e.g. at the ppt values recommended for drinking water (0.1 µg/L for sum of PFAS (Drinking Water Directive EU 2020/2184)).

Keywords:
PFAS free UHPLC hardware, per- and polyfluoroalkyl substances, PFAS analysis, environmental, drinking water/surface water, Bruker Elute UHPLC

But how can Bruker enable sensitive analysis of PFAS?

Bruker offers a PFAS kit* including

- PEEK solvent tubings for pump and autosampler
- Stainless steel solvent filter (PTFE free)
- 15 cm MarvelXact tubing (connection mixer to delay column)
- 50 cm MarvelXact tubing (connection delay column to autosampler)
- Restek PFAS delay column, 5 µm, 50 x 2.1 mm
- PEEK tubing for pump/degasser connections

Filters are PTFE free and PEEK tubing are used to avoid any PFAS contamination.

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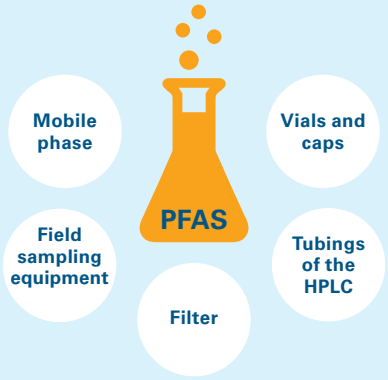


PFAS sources inside the lab

Bruker's PFAS kit enables sensitive PFAS screening mandatory for environmental protection. The delay column is installed after the mixing chamber and before the injector of the HPLC to ensure that the analysis is not disturbed by PFAS from the system e.g. present in the mobile phase. The instrument related PFAS are retained on the delay column before reaching the analytical column. Due to the delayed elution of the background PFAS compared to the PFAS of the sample the target PFAS can be identified and quantified.

The PFAS kit allows the elimination or significant reduction of PFAS contaminants in blank samples. Thus, the PFAS kit empowers unambiguous identification and sensitive quantitation of PFAS in samples requiring national and regional regulations.

Reducing PFAS background from the system

When running PFAS analysis on your MS instrument, PFAS eluting from the LC instrument can determine an increased background. The success of Bruker's PFAS kit for reducing PFAS background from the instrument is shown in Figure 1. A blank is analyzed on the EVOQ-LC triple quadrupole MS. Perfluorohexanoic acid (PFHxA) – a PFAS that bioaccumulates in human blood – was observed in the instrument blank. With the PFAS kit, the background signal is reduced and interferences are removed.

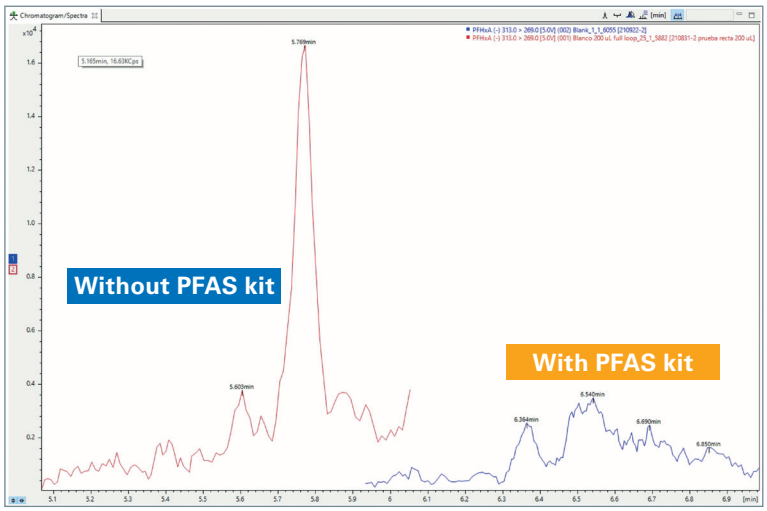
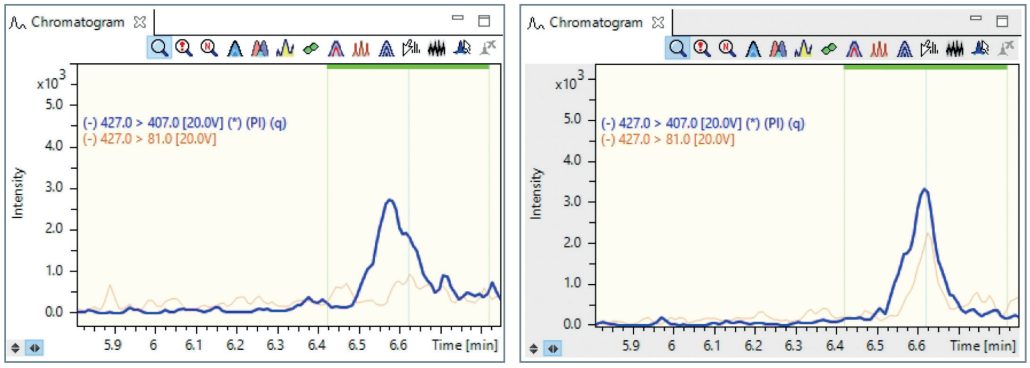


Figure 1
Analysis of a blank with EVOQ-LC triple quadrupole MS.
PFHxA (transition 313 > 269) is analyzed; Red line: without PFAS kit; blue line: with PFAS kit. Due to the delay column, RT is shifted with the PFAS kit.

Lower your detection limit with Bruker's PFAS kit

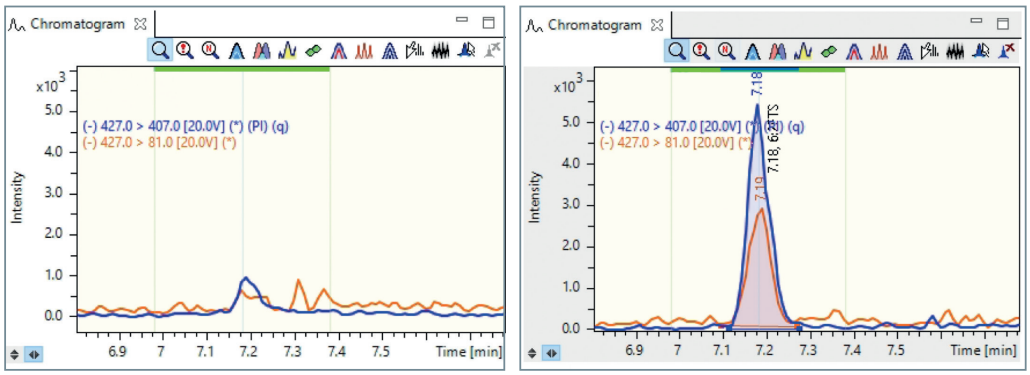
To prove the suitability of the kit, Figure 2 shows an example of the analysis of tap water that was either not-spiked or spiked with 5 ppt 6:2 FTS on the EVOQ-LC triple quadrupole MS. The analysis was done without and with the PFAS kit. Without the PFAS kit the intensity of 6:2 FTS was pretty much the same regardless of whether it was a blank or a spiked example. It is not possible to distinguish between a spiked and a non-spiked sample without the kit. Adding a delay column to the system is an efficient way to differentiate between these samples. With the kit, it is possible to detect a real sharp peak and quantitate the compound even at low concentrations.

Without PFAS kit



Blank 5 ppt

With PFAS kit



Blank 5 ppt

Figure 2
Analysis of tab water that has either not been spiked (Blank) or has been spiked (5 ppt of 6:2 FTS).
The injection volume was 100 µL and the expected RT 6.58 min (without the kit) and 7.19 min (with the kit). Due to the delay column, RT is shifted with the PFAS kit.

Significant reduction of PFAS contaminants in blanks

The PFAS kit allows the elimination or significant reduction of PFAS contaminants in blank samples. Furthermore it causes a retention time delay so that instrument-related PFAS do not interfere with PFAS from the injected sample (see Figure 3). Bruker's PFAS kit enables unamgiuous identication and sensitive quantitation of PFAS inside the sample.

Without PFAS kit **With PFAS kit**

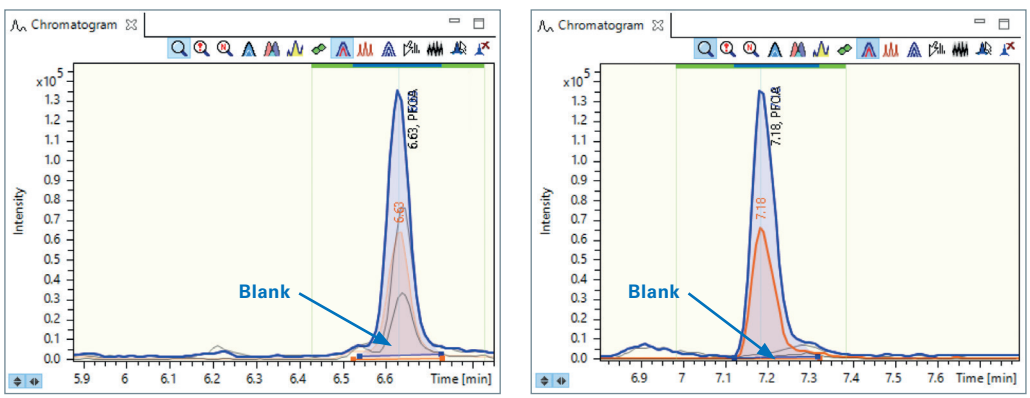
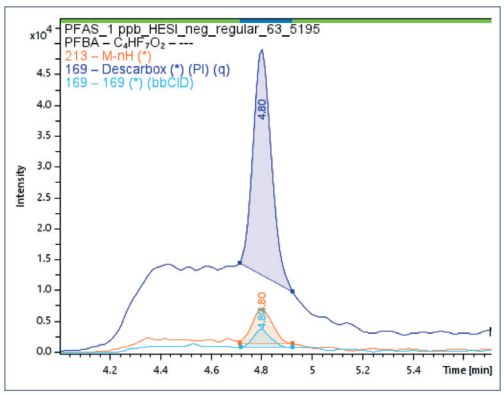


Figure 3
Analysis of tap water spiked with 10 ppt PFOA.
Signals for each transition are in blue and orange. Grey line belongs to the corresponding blank (tap water).

Improvement of detection limit

Here in Figure 4, the analysis of PFBA is shown with and without the PFAS kit on the impact II QTOF instrument. With the PFAS kit, the background is reduced and PFBA appears in a well-defined peak shape. The baseline separation is improved due to the PFAS kit.

Without PFAS kit



With PFAS kit

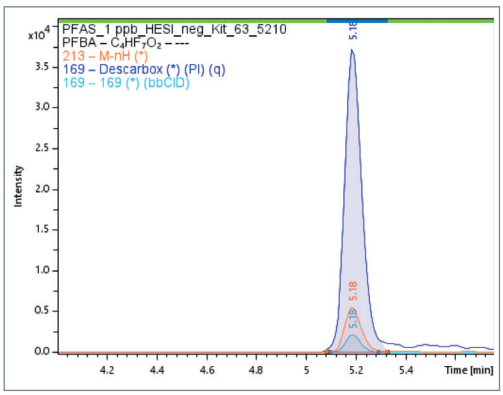


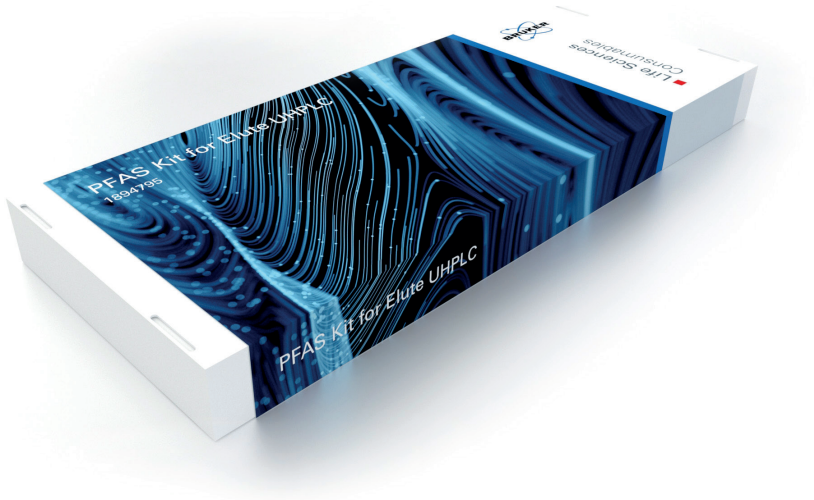
Figure 4
Extracted ion chromatograms (EICs) of principal and qualifier ions of PFBA (Perfluorobutanoic acid) analyzed with impact II equipped with a VIP-HESI source.
Injection of 2 µL of a 1 ppb solution. Due to the delay column, RT is shifted with the PFAS kit.

Conclusion

Bruker's PFAS kit is an ideal solution for:

- Separation of target PFAS from system contaminants
- Reliable quantitation results
- Lower limits of detection

*Order information: PFAS Kit for Elute UHPLC #1894795



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