the Analytical Scientist

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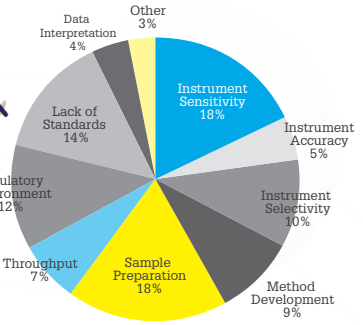
PFAS SURVEY 2023

We recently asked our readers for their thoughts on the challenges involved in PFAS analysis, whether current methods are up to the task, and what analytical advances may be on the horizon. Here, we share the results.

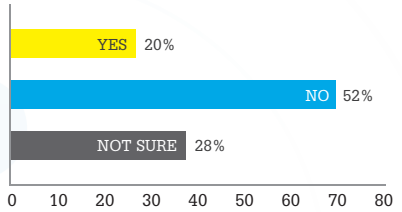
Which environmental chemical pollutant do you consider most concerning today?

- PFAS
- 6PPD-quinone
- Ethylene Oxide
- Plasticizers
- PM2.5 Particulate matter less than 2.5 microns
- Perfluorooctanoic acid (PFOA)
- CO2
- Blood
- Heavy metals content
- Any endocrine disruptors are of concern
- PFOS
- Nitrosamines, PAHs, HAA
- Dioxins/PCBs and heavy metals
- PCBs

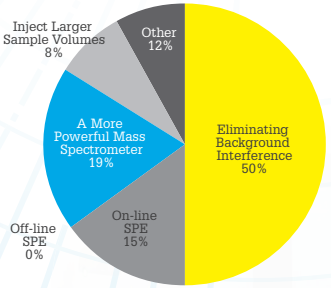
What are the main challenges related to PFAS analysis?



Are current analytical methods PFAS analysis sufficient?



Which of the following options are most desirable for improving sensitivity for PFAS testing in your lab.



What technique(s) other than LC/MS allow for sensitive short-chain (less than C7) PFAS determination?

Method 533, 537 and 537.1
GC/HRMS
GC-MS, GC-MS/MS, CRDS, FTIR, PTR-MS, Tof-CIMS
GC-MS
GC-MS/MS
Draft Method 1633 for 40 PFAS Compounds & Draft Method 1621 for Adsorbable Organic Fluorine
IC
GPC
TOF by CIC, but not as sensitive as LC/MS currently
LC/MS (Liquid Chromatography/Mass Spectrometry)
Atd GC/MS
Ion chromatography and fluorometric detection can be considered. But these methods require extensive pretreatment and/or derivatization with a fluorophore prior to analysis.
19F NMR

Are there any emerging areas of concern with regard to PFAS contamination?

- Ultra short chain, FTOH's
- Food
- Air
- Vapor intrusion, indoor and outdoor air exposures
- Agricultural soil and water
- Accumulation in the body and environment
- Sulfluramid contamination
- Alienated outspace materials
- Selectivity
- Food supplies need to be more thoroughly vetted/studied
- Lack of analytical techniques to assess widespread contamination of 1000s of possible compounds at sensitive detection limits
- Yes. The regional characteristics of developing countries (Latin America, Asian countries, and Africa), such as the economy and land characteristics, request attention for specific classes of pollutants, making the prioritization process more complex. These regions do not have legislation or regulatory actions regarding the use, production, and commercialization of PFAS. Thus, no current programs control the environmental levels of these compounds (mainly in drinking water), and neither are the levels in organisms (through biomonitoring studies).
- The requested LODs in highly complex waters such as leachates where they want drinking water levels
- Migration of PFAS from food contact articles
- Unknown degradation products
- Ensuring adequate sampling methods are followed to prevent contamination
- High levels in processed food

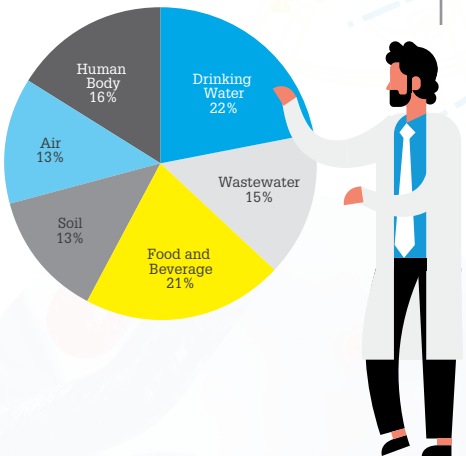
What analytical advances are on the horizon for PFAS analysis?

GC-MS/MS PCI for FTOH's, Combustion Ion-Chromatography, LC-HRMS Screening
Methylene blue
Direct field analysis of PFAS, total PFAS measurements
dSPE as a clean up process and allowing to concentrate for more sensitivity and as well as Super critical fluid analysis
Ion Exchange resins
Fast analysis with accurate results
Increase sensitivity & specificity
TFA
HPLC improvements
Employing GC for volatile PFAS; non-target analyses to continue
to explore the extent of chemicals released into the environment
Widespread acceptance of non-targeted screening as an alternative to LC analysis
Improvements in sensitivity and range of these methods
High resolution LCQQQ
PFAS free consumables, SPE, delay column and HPLCMSMS allowing large volume injection
More options for analytical standards
Improvements to sensitivity, selectivity and accuracy
Greater sample preparation automation capabilities

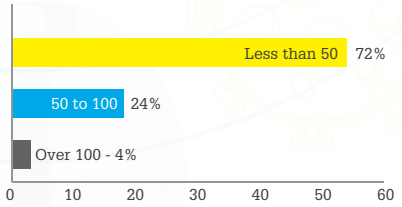
What are the most important methods used in PFAS analysis?

- LC-MS
- Method 533
- LC, GC, GFAA
- LC-MS/MS
- EPA 533, 537
- LC-MS/MS with dSPE
- Direct analytical methods
- Target & Non-Target Methods
- TBA-extraction
- EPA 537.1/533 are important for drinking water, but EPA 1633 is filling a void for other matrices, but depends on a complicated sample prep
- AOF, TOF, LC-MS/MS
- LCQQQ and on-line SPE
- LC-QTOF
- WAX SPE enrichment and clean up, PFAS kit for HPLC and sensitive MS
- EPa 1633 and non-targeted screening

Which areas are currently most important in PFAS analysis?



PFAS contains many structural isomers. How many targets can most routine analyses identify?



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