







PFAS FOCUS Chromatography Consumables For Testing & Analysing Forever Chemicals









"PFAS persist and accumulate in soil, water, air, wildlife, our bodies."

"PFAS has been found in human breast milk."

"PFAS is found in the blood of 97% of the American population."

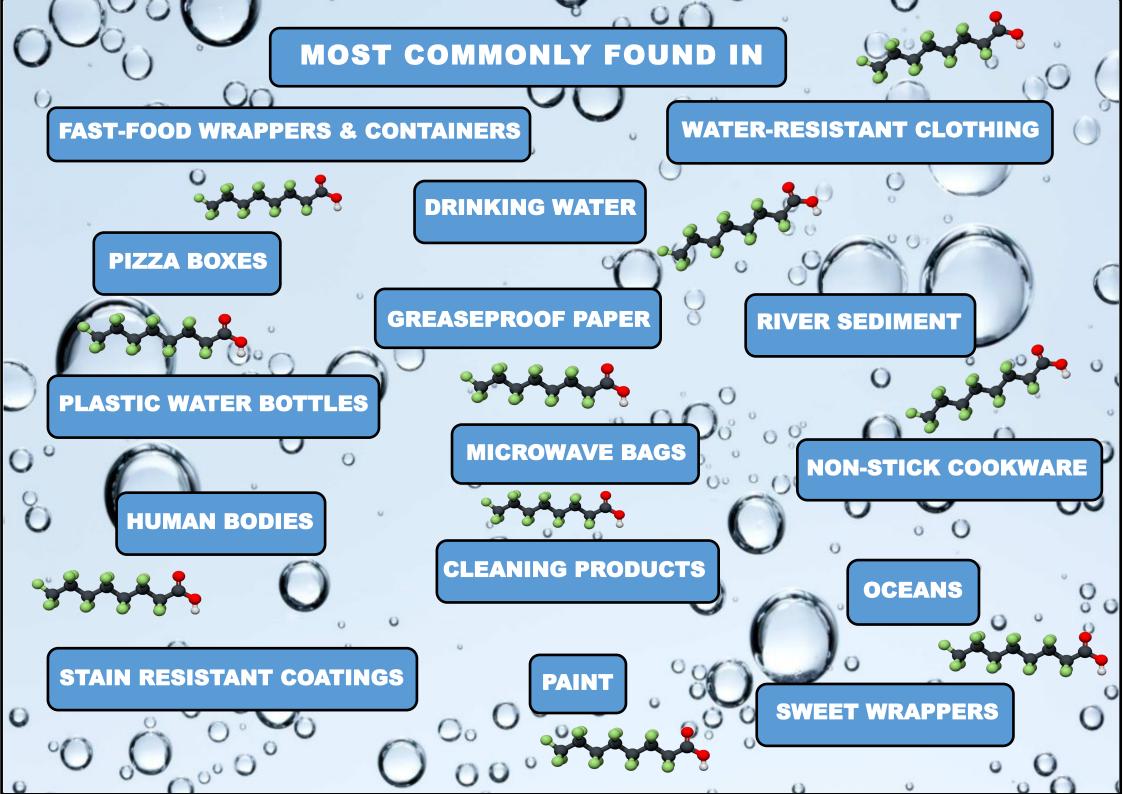
"PFAS has been linked to fertility problems and changes in metabolism."

"PFAS has been linked to an increased risk of obesity and some cancers."

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"Globally PFAS is found in rivers, lakes and every ocean on our planet." "PFAS has been detected on Mount Everest. There is no-where that PFAS is not present. It is in the soil, the air and water."

"PFAS is manmade, it is damaging our environment on a daily basis."



FRAGRANCE



FLAVOURS



COSMETICS



TEXTILES



MINING



ENERGY

ELECTRICITY, GAS, SOLAR, ATOMIC, RENEWABLES



PETROCHEMICAL

OIL, GAS, PETROLEUM



ENVIRONMENTAL

WATER, AIR, SOIL



FOOD



TESTING & PRODUCT DEVELOPMENT





AGRICULTURAL



FORENSICS



CHEMICAL







Are all PFAS toxic to humans?

This is a question that remains to be answered. Research over many years will provide the data needed to analyse the impact PFAS has on the environment. Some PFAS, sometimes used in construction materials are not released into the air or water table when it rains but they are released when buildings are demolished and the debris is sent to landfill.



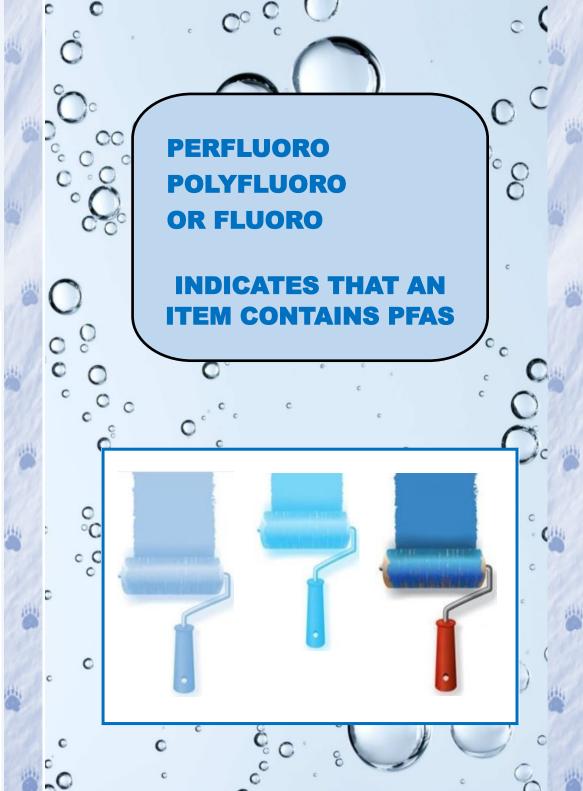
Should we be concerned?

Some PFAs are of a more immediate concern as they are released into the environment when they are used or when they come into contact with water. Small residual PFAS molecules wash off easily and are carried to the soil, air and water very quickly. Many short-chain PFAS dissolve in water. Gradually, over time, the PFAS sinks to the depths of oceans and rivers, settles in the sediment and becomes a concern as marine life feeds on plants and other animals that are in the sediment. Some PFAS such as PFOA act like detergents, they repel water and rise back to the surface, they are then released into the atmosphere as droplets. Some scientists believe that spray from the oceans is the biggest source of atmospheric PFAS.



PFAS (per- and polyfluoroalkyl substances), known as "forever chemicals" are found in everyday objects. Food Packaging, paints, cosmetics, wood lacquers, sealants, solar panels, fire fighting foams, artificial grass and many more seemingly innocent products.

Generally used to prevent corrosion and make products waterproof and stain-resistant they are present in our everyday life. Unfortunately they do not break down in our environment and as a consequence are "forever present".



TESTING FOR PFAS?



Wellington Laboratories has been committed to providing high quality reference standards and exceptional customer service since its inception in 1980.

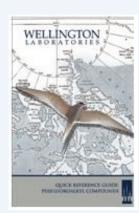
The primary source of Standards for EPA Methods 23, 513, 1613, 1668, 8280, 8290, European Method EN-1948 and World Health/EPA Standards, C13 and Native Dioxins, Furans, PCBs and Brominated Diphenyl Ethers, Brominated Dioxins and Furans, Methylated PCDDs and PCDFs, Fluorinated Compounds and more.

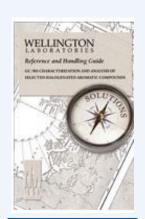
Wellington's Quality Documents









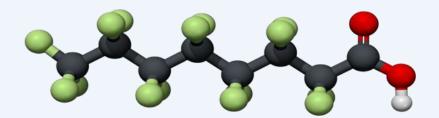




SCAN ME

General Concepts of Organofluorine Chemistry for PFAS

Organofluorine Chemistry: A branch of organic chemistry involving organic molecules with a carbon-fluorine bond. Organofluorine molecules have many commercial uses. They include PFAS, such as PFOA, shown below:



EXAMPLE: 3D model of a PFOA (perfluorooctanoic acid) molecule, in its acid form.

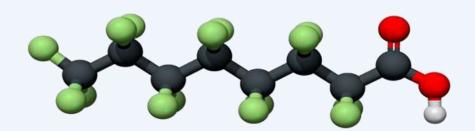
Source: Manuel Almagro Rivas (Own work using: Avogadro, Discovery Studio, GIMP) [CC BY-SA 4.0] (https://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons. https://commons.wikimedia.org/wiki/File:PFOA-3D.png

Gray spheres represent carbon atoms linked together in a chain; there are eight of them, so "octane" is used in the name. Green spheres represent fluorine atoms bonded to carbon atoms. Red spheres represent oxygen atoms. White sphere represents a hydrogen atom that dissolves away in water, which makes this an acid. Fluorine atoms are attached to all possible bonding sites, making this *per*fluorinated. If some of the fluorine atoms were replaced by other atoms (such as oxygen or hydrogen), it would be *poly*fluorinated. Without the hydrogen, the "head end" takes on a

General Concepts of Organofluorine Chemistry for PFAS

Isomer: A molecule with the same molecular formula as another molecule, but with a different chemical structure. Isomers contain the same number of atoms of each element, but have different arrangements of their atoms. See imagefor an example; linear and branched PFOS contain the same number of carbon, fluorine, oxygen, and sulfur atoms, but these atoms are arranged differently depending on whether it is a linear or branched isomer of PFOS.

Homologue Groups and Homologous Series: A group of organic compounds, usually listed in order of increasing size, that has a similar structure (and therefore also similar properties) and whose structures differ only by the number of carbon atoms in the chain. For example, all of the linear and branched isomers of PFOS would be in the C_8 homologue group, while all of the linear and branched isomers of perfluorohexane sulfonic acid (PFHxS) would be in the C_6 homologue group. The C_4 -





Per- and Polyfluoroalkyl Substances (PFAS) are an emerging class of environmental contaminants. Their unique properties create a host of analytical challenges that require the use of native and mass-labelled standards for the generation of accurate data.



The most notable PFAS include PFOS (perfluorooctanesulfonate) and PFOA (perfluorooctanoic acid) and Wellington Laboratories currently offers multiple mass-labelled standards for these compounds to meet your analytical needs. In fact, Wellington offers a large selection of native and mass-labelled per- and poly-fluorinated compounds, including:





Perfluorooctanesulfonamides (FOSAs)

Perfluorooctanesulfonamidoethanols (FOSEs)

Perfluorooctanesulfonamidoacetic acids (FOSAAs)

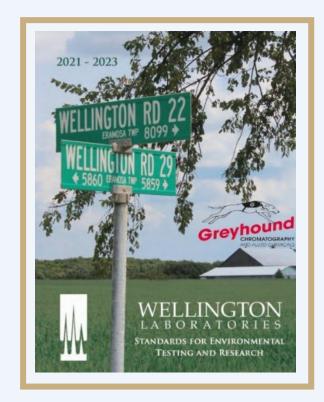
Telomer Alcohols (FTOHs)

Telomer Acids (FTAs)

Telomer Sulfonates (FTSs)

Perfluoroalkylphosphonic acids (PFAPAs)

Perfluoroalkylphosphinic acids (PFPi's)





Wellington started to synthesize perfluorinated compounds in 2004 and, since then, Wellington Laboratories have regularly added new native and mass-labelled standards to their inventory.



- PFC-C-CVS Calibration Set and Support Solutions
- Perfluoroalkanesulfonates (PFASs)
- Perfluoroalkylcarboxylic acids (PFCAs)
- Perfluorooctanesulfonamides (FOSAs)
- Perfluorooctanesulfonamidoethanols (FOSEs)
- Perfluorooctanesulfonamidoacetic acids (FOSAAs)
- Fluorinated Telomer Alcohols (FTOHs)
- Fluorinated Telomer Acids (FTAs)
- Unsaturated Fluorinated Telomer Acids (FTUAs)
- Perfluoroalkylphosphonic Acids (PFAPAs)
- Perfluoroalkylphosphinic Acids (X:XPFPi)
- Polyfluorinated Phosphate Esters (PAPs and SAmPAPs)
- Fluorinated Telomer Acrylates and Acetates (FTAcrs and

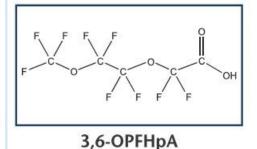


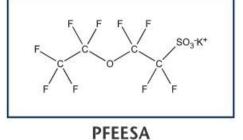
PFCs are still emerging environmental contaminants and each of the groups of compounds listed above pose unique analytical challenges. In addition, the individual isomers, such as the branched PFOA and PFOS isomers, are being found to have different toxicokinetic and ecokinetic properties. Wellington Laboratories' inventory of PFCs will continue to grow.



Testing for PFAS in Everyday Products

In response to the ever increasing demand for new Reference Standards to test for the presence of PFAS in everyday products Wellington Laboratories has increased its product line to include four new perfluoroether and perfluoropolyether-carboxylic acids (PF40PeA, PF50HxA, 3,6-0PFHpA and P5MeODIOXOAc), a perfluoroethersulfonate (PFEESA), perfluorodecanesulfonamide (FDSA-1) and N-methylperfluorobutanesulfonamide (N-MeFBSA-M).







SCAN ME

PFAS and Other Toxic Forever Chemicals in Drinking Water



For over 30 years the European Union have worked tirelessly to protect the integrity of our drinking water. EU officials have recently reached a provisional agreement to update the Union's 1998 Drinking Water Directive to tighten up the permissible limits allowed for both PFAS and several other drinking water contaminants, including bisphenol-A, microplastics, lead and chromium. At the time of writing the European Parliament and Council are still to formally

European drinking water standards currently far exceed the standards set in the United States but this is changing picture as state by state new instances of contaminants are emerging. Currently, the U.S. Environmental Protection Agency has only issued a non-enforceable health advisory of 70 ppt for PFOA, formerly used by DuPont to make Teflon, and PFOS, formerly an ingredient in 3M's Scotchgard. Those compounds are no longer manufactured in the U.S., but they and other PFAS contaminate the drinking water for an estimated 110 million Americans.





NEW PRODUCTS PFAS TESTING STANDARDS

Native & Mass-Labelled PFAS Solution/ Mixtures

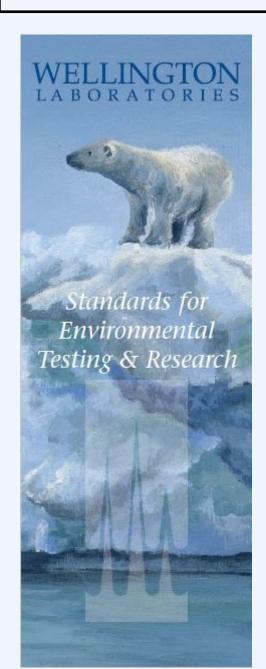
Compatible with U.S. EPA Draft Method 1633

Wellington Laboratories is pleased to support U.S. EPA Draft Method 1633 for the analysis of PFAS in aqueous, solid, biosolid and tissue samples by releasing compatible prime stock solutions. To offer the greatest degree of flexibility with other applications, a series of native (PFAC-MXF, PFAC-MXG, PFAC-MXH, PFAC-MXI and PFAC-MXJ) and mass-labelled (MPFAC-HIF-ES and MPFAC-HIF-IS) stock solutions have been prepared. These mixtures can be diluted and/or combined to achieve the spiking and calibration solutions recommended by the method.

SCAN ME

EPA Draft Method 1633 - Further Information

WELLINGTON REPORTER 8 OCTOBER 2021





Native Certified Reference Standards for L-PFUdS & L-PFTrDS

In early 2020 the European Parliament and the Council of the European Union released new requirements for the analysis of per- and polyfluoroalkyl substances (PFAS) in water intended for human consumption (5813/20). Unfortunately this amendment to Council Directive 98/83/EC included perfluoroalkanesulfonates that were not commercially available. In response to this, Wellington Laboratories synthesized, purified, characterised and prepared accurate Certified Reference Standards of the required substances: sodium perfluoro-1-undecanesulfonate (L-PFUdS) and sodium perfluoro-1-tridecanesulfonate (L-PFTrDS).

Wellington Laboratories have also prepared a native solution/mixture (EU-5813-NSS) that contains all of the PFAS listed in the drinking water directive (5813/20) for your convenience. This solution/mixture can be used in conjunction with two of Wellington's existing mass-labelled PFAS mixtures to easily prepare a calibration set for quantitation:

Suggested Extraction Standard Mixture: MPFAC-C-ES

Suggested Injection Standard mixture: MPFAC-C-IS

PFAS STANDARDS



WELLINGTON PRODUCT UPDATES FROM WELLINGTON LABORATORIES REPORTED

Native & Mass-Labelled PFAS Mixtures Compatible with U.S. EPA Draft Method 1633

Native PFAS Certified Reference Standards

ISO 21675:2019 Solution/Mixtures

Native PFAS Solution/Mixtures

Aqueous Film-Forming Foam PFAS

New PFAS Reference Standard Solutions

New PFAS Solution/Mixture PFAC30PAR

Aqueous Film-Forming Foam PFAS







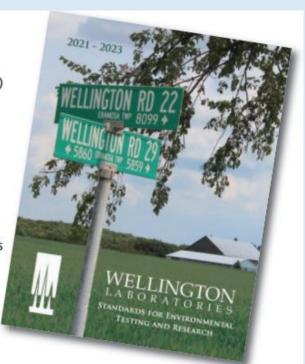
NEW ADDITIONS TO OUR PRODUCT LIST

Alternative Method 16130 Calibration Set (16130CVS)

Mass-Labelled PCDD Window Defining Mixture (MD5CWDS)

Mass-Labelled PCDF Window Defining Mixture (MF5CWDS)

35 Individual Native OCP Standards 24 Individual Mass-Labelled OCP Standards PCN Calibration Set (PCN-CVS-A) & Support Solutions 27 Individual Native PCN Standards 14 Individual Mass-Labelled PCN Standards and more....





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SOLUTIONS FOR PFAS ANALYSIS









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Solutions for PFAS analysis

More than 4730 compounds belong to the group of PFAS (which stands for per- and polyfluoroalkyl substances), which have been produced since the 1940s. Since these compounds do not originate in nature, global pollution is the result of human activities. PFAS are "forever chemicals", chemicals that are very persistent in the environment and in the human body. For reliable PFAS analysis, we have developed products that are ideally suited for sample preparation, sample integrity and determination of these harmful substances by HPLC.

The special phase for sample preparation – CHROMABOND® PFAS

CHROMABOND® PFAS is a polymer-based combination phase which contains a weak anion exchange functionality. The combination of different SPE phases makes it possible to use various interactions (dipole-dipole, ionic, hydrophobic, H-bond).

SPE product solutions - CHROMABOND® HR-X and HR-XAW

According to DIN 38407-42, EPA 537.1 and 533 guidelines, MACHEREY-NAGEL also offers further SPE product solutions for the enrichment of PFAS:

- CHROMABOND® HR-X: hydrophobic PS / DVB copolymer
- CHROMABOND® HR-XAW: weak mixed mode anion exchanger (WAX) PS / DVB copolymer

These allow outstanding recovery rates and high reproducibility.



CHROMABOND® PFAS provides several advantages

- Solution for various PFAS substances classes
- > 28 PFAS can be enriched
- Sorbent rentention mechanisms according to DIN 38407-42, EPA 537.1 and 533 guidelines
- High capacity
- High recovery rates





PFAS in food using QuEChERS extraction and clean-up method

QuEChERS ("Quick, Easy, Cheap, Effective, Rugged and Safe") sample preparation products from MACHEREY-NAGEL ensure a time efficient and simple extraction of PFAS from food and a subsequent solid phase extraction for further sample clean-up according to procedure C-010.01 developed by the US Food and Drug Administration (FDA) for the measurement of 16 PFAS in food.



dSPE columns, CHROMABOND® QuEChERS Mix XII, 15 mL centrifuge tubes, CHROMABOND® QuEChERS Mix XX, 2 mL centrifuge tubes

Good to know

There are CHROMABOND® QuEChERS mixes available that are especially suitable for sample preparation of PFAS in:

- Dairy products
- Bread
- Lettuce
- Fish







Plastic vials and fluorine-free closures for PFAS analysis

When you are doing PFAS analysis, it is crucial to select the right vials and closures for this application. Adsorption effects of glass as well as possible contaminations of the sample by particles from the septa, especially from the PTFE lamination, may put your analysis results at risk.

MACHEREY-NAGEL offers polypropylene screw neck vials N 9 and snap ring vials N 11 as well as appropriate closures with a silicone/polyimide septum that – in contrast to PTFE laminated liners – is fluorine-free.



Polypropylene vials and fluorine-free closures for PFAS analysis



Get more details

If you want to learn more, read the detailed PFAS test report showing the performance of different MN vials and fluorine-free closures in PFAS analysis.



Solutions for PFAS analysis

The special HPLC columns: NUCLEODUR® PFAS and NUCLEODUR® PFAS Delay

NUCLEODUR® PFAS HPLC columns are a perfect choice for analyzing PFAS substances. These columns show a high batch-to-batch reproducibility, are specially batch tested for PFAS analyses and are very well suited for LC-MS due to a low bleeding characteristics.

The NUCLEODUR® PFAS Delay column provide high retention for PFAS compounds and are used to retain PFAS contaminants from the HPLC system, which could otherwise falsify the sample to be analyzed. For this purpose, the NUCLEODUR® PFAS Delay column is connected in flow direction between the mixing vessel and the sample injector.



Hustration of installation and usage of NUCLECOUR*PEAS Delay column



NUCLECOUR® PEAS analytical HPLC column





Product selection according to ISO 21675:2019, DIN 38407-42, EPA 537.1, 533, 8327 and FDA C-010.01 guidelines

Method → Product type ↓	ISO 21675:2019 and DIN 38407-42	EPA 537.1	EPA 533	EPA 8327	FDA C-010.01
CHROMABOND® PFAS (REF 730283)	CHROMABOND® HR-X (REF 730939)	CHROMABOND® HR-XAW (REF 730745) CHROMABOND® PFAS (REF 730283)	Direct injection	QuEChERS Mix XII	
				(REF 730648) CHROMABOND® QUECHERS Mix L (REF 7300008) CHROMABOND® QUECHERS Mix XX (REF 730670.2)	
Delay column	EC 50/2 NUCLEODUR® PFAS Delay, 5 μm (REF 760673.20)				
HPLC column	EC 50/2 NUCLEODUR® PFAS, 3 µm (REF 760663.20)				
	EC 100/2 NUCLEODUR® PFAS, 3 µm (REF 760666.20)				
Vials and caps	0.3 mL N 9 screw neck vial, PP transparent (REF 702009)				
	0.7 mL N 9 screw nack vial, PP transparent (REF 702010)				
	1.5 mL N 9 screw neck vial, PP transparent (REF 702500)				
	0.3 mL N 9 screw neck vial, PP amber (REF 702172)				
	0.3 mL N 11 snap ring/crimp neck vial, PP transparent (REF 702809)				
	0.7 mL N 11 snap ring/crimp neck vial, PP transparent (REF 702174)				
	0.3 ml. N 11 snap ring/crimp neck vial, PP amber (REF 702173)				
	N 9 screw closure, PP, blue, silicone white / polymide orange (REF 702402)				
	N 11 snap ring closure, PE (soft), light blue, silicone white / polimide orange (REF 702403)				







MACHEREY-NAGEL





MN application note 05/2021

PFAS analysis in water matrices by simple sample preparation followed by liquid chromatography/tandem mass spectrometry (LC-MS/MS) analysis according to EPA 8327

MACHEREY-NAGEL

Chromatography application note



MN application note 02/2021

PFAS Analysis According to EPA 533

MACHEREY-NAGEL application department · Dr. H. R. Wollseifen, T. Kretschmer, L. Emmerich

MACHEREY-NAGEL

Chromatography application note



MN application note 04/202

PFAS Analysis According to ISO 21675:2019 and to DIN 38407-42

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Chromatography application note



MN application note 01/2021

PFAS Analysis According to EPA 537.1

MACHEREY-NAGEL

Chromatography application note



MN application note 03/2021

PFAS Analysis According to EPA 533 and to EPA 537.1

MACHEREY-NAGEL

Chromatography application note



MN application note 06/2020

Solid phase extraction of per- and polyfluoroalkyl substances (PFAS) from clothing

MACHEREY-NAGEL



Chromatography application note Since

MN application note 05/2020

Solid phase extraction of per- and polyfluoroalkyl substances (PFAS) from drinking water

MACHEREY-NAGEL Chromatography application note



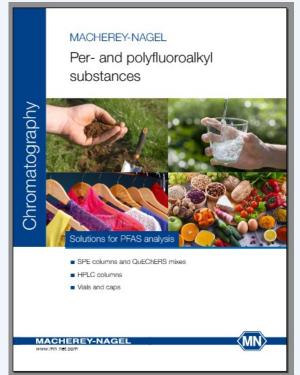
MN application note 07/2020

Solid phase extraction of per- and polyfluoroalkyl substances (PFAS) from contaminated soils



Determination of PFAS from food according to FDA Method C-010.02









SCAN ME

Convenience kits for Perfluoroalkyl and Polyfluoroalkyl (PFAS) Testing



Because Perfluoroalkyl and Polyfluoroalkyl substances do not decompose, they can accumulate over time in the environment and the human body. There is increasing evidence that exposure to PFAS can adversely affect human health. As a result, regulatory bodies are legislating that many materials should be tested to ensure that they do not contain traces of PFAS or that the traces are below permitted legal limits.

Because PFAS are widely used in materials such as PTFE, that are commonly used in chemical analysis consumables, laboratories need new laborate products to minimize background contamination from these chemicals.

VIEW THE FULL RANGE



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COSMETICS



TEXTILES



MINING



ENERGY

ELECTRICITY, GAS, SOLAR, ATOMIC, RENEWABLES



PETROCHEMICAL

OIL, GAS, PETROLEUM



ENVIRONMENTAL

WATER, AIR, SOIL

CHEMICAL



FOOD



WINE, BEER & SPIRITS **TESTING & PRODUCT DEVELOPMENT**



AGRICULTURAL





Greyhound CHROMATOCRAFIE

AND ALLIED CHEMICALS







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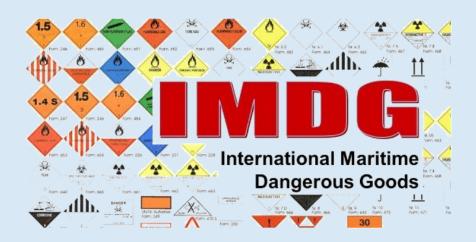
Greyhound will take care of all the paperwork, certification, despatch and transport issues, so you can relax and look forward to receiving your goods.

By air, sea, road or rail. Greyhound products will arrive on time, every time.

Our IATA, ADR (Road) and IMDG (Sea) trained Logistics Department have many year's experience of shipping hazardous and non-hazardous materials around the world. Greyhound prides itself on using our extensive logistics knowledge to facilitate successful delivery of your goods, either to your door or an approved airport.







USEFUL LINKS

GREYHOUND CHROMATOGRAPHY WEBSITE

GREYHOUND CATALOGUE DOWNLOADS

WELLINGTON LABORATORIES WEBSITE

Q-RANGE PFAS ANALYSIS SCREW TOP VIALS

PFAS VIAL SAMPLING KITS

MACHEREY-NAGEL PFAS PRODUCTS

WELLINGTON LABORATORIES PFAS REFERENCE STANDARDS

PFAS FOCUS—PFAS IN DRINKING WATER

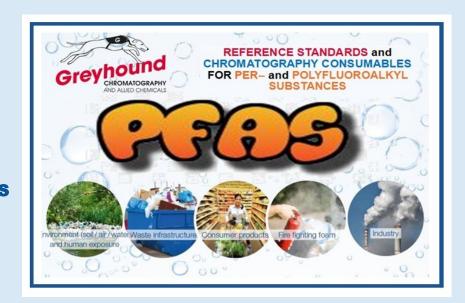
MIXED NATIVE PFCAs AND PFASs SOLUTION

PFOS/PFOA ISOMERS

AQUEOUS FILM-FORMING FOAM PFAS











WELLINGTON PRODUCT UPDATES FROM WELLINGTON LABORATORIES REPORTED

Wellington Reporters 2012 **Combined Documents**



Wellington Reporters 2013 **Combined Documents**



Wellington Reporters 2014 Combined Documents



Wellington Reporters 2015 **Combined Documents**



Wellington Reporters 2016 **Combined Documents**



Wellington Reporters 2017 **Combined Documents**



Wellington Reporters 2018 Combined Documents



Wellington Reporters 2019 Combined Documents



Wellington Reporters 2020 **Combined Documents**



Wellington Reporters 2021 Combined Documents





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