ITRC PFAS Chemistry Explained
Questions & Answers: October 9, 2025 Course Offering
Sponsored by: Interstate Technology and Regulatory Council

This question-and-answer file is a reference of the questions asked during the live training course held on October 9, 2025 and archived on the Clu-In website. Additional details have not been provided to these answers. Additional information is available in the PFAS Technical and Regulatory Guidance (https://pfas-1.itrcweb.org/).

How long have AFFFs been used for?
They were created and first used in the 1960s. Section 3 of the ITRC Technical and Regulatory Document covers the history and characteristics of AFFF. https://pfas-1.itrcweb.org/3-firefighting-foams/

Is there a way to find out what a short chain PFAS (C=2 or 3) was prior to degradation? Would you assume that it was a polyfluoroalkyl substance w/ only 2 or 3 C-F bonds as those were the bonds likely wouldn't have broken down?
For more information about other PFAS topics, please visit the ITRC PFAS-1 resources at pfas-1.itrcweb.org. In particular, https://pfas-1.itrcweb.org/5-environmental-fate-and-transport-processes/#5_4 may be of interest.

What are the reasons for the replacement chemistry when we don't understand the toxicity? Is it simply because they are not regulated?
Please visit the ITRC PFAS-1 resources at pfas-1.itrcweb.org. In particular, https://pfas-1.itrcweb.org/2-4-pfas-reductions-and-alternative-pfas-formulations/ may be of interest.

Aren't polyfluoroalkyl substances persistent/resistant to transformation in anaerobic conditions?
For more information about degradation, you can check out the ITRC PFAS-1 resources at pfas-1.itrcweb.org. There is a section on Anaerobic Biological Pathways in section 5.4.4.3.

How long does it take them to break down?
We will have a table of precursor degradation rates coming out in the ITRC Priority Topics update. It should be published by the end of the year.

How does an isomer being branched or not affect volatilization, adsorption to soil particles?

There is some information on the differences in sorption between linear and branched isomers in Section 5.2.3.3 at https://pfas-1.itrcweb.org/5-environmental-fate-and-transport-processes/#5_2

Why do long chain PFAS have less mobility, is it primarily due to van der Waals forces?
The sorption of PFAAs to organic matter will increase with increasing chain length, which is also associated with hydrophobicity. You can see more about this in Section 5.2.3.3 at https://pfas-1.itrcweb.org/5-environmental-fate-and-transport-processes/#5_2

Ionic vs acid. CAS designation at what pH?
Section 4 of the PFAS-1 document talks about pKa of PFAS, Specifically section 4.3.2 . https://pfas-1.itrcweb.org/4-physical-and-chemical-properties/#4_3

How can PFAS be both lipophobic *and* hydrophobic? Especially with the carbon tail I would expect it to prefer nonpolar solutions (and as the tail increases in length).
The fluorinated tails of PFAS are known to simultaneously impart both hydrophobic and lipophobic properties on the molecule. Section 4.3.1 of the PFAS-1 document gives a good overview of how the carbon-fluorine bond gives PFAS some unique physical and chemical properties. https://pfas-1.itrcweb.org/4-physical-and-chemical-properties/#4_3

Could you discuss how the negatively charged soil results in good sorption of the anions?
Negative charge on soil tends to have a repelling effect on the negatively charged heads of anionic PFAAs, reducing sorption. Section 5 of the PFAS-1 document talks about environmental fate and transport, and electrostatic interactions are discussed in the introduction to phase partitioning (Section 5.2.1) and specifically in Section 5.2.3.2. https://pfas-1.itrcweb.org/5-environmental-fate-and-transport-processes/

Do PFAS form a LNAPL or DNAPL?
There is some discussion of Density of PFAS in Section 4.2.2 at pfas-1.itrcweb.org.

Can you speak more on PFAS fate and transport in biosolids, such as if biosolids are not sent to landfill and applied to the environment at application sites and then if food crops or grazing occurs at these sites, can PFAS biosolids possibly become available for bioaccumulation?
For more information about Fate and Transport of PFAS, and other PFAS topics, please visit the ITRC PFAS-1 resources at pfas-1.itrcweb.org. There will be biosolids-specific trainings and information coming in 2026.