

Total Organofluorine (TOF) Analysis by Combustion Ion Chromatography: A New Tool for Monitoring PFAS Impacts

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Background/Objectives. Total organofluorine (or 'organic fluorine') analysis refers to the measurement of fluorine that originates from any substance where fluorine is attached to a carbon backbone. It is gaining interest as a potentially faster and less expensive option for monitoring per- and polyfluorinated alkyl substance (PFAS) impacts in soils, water and aqueous film-forming foam (AFFF). The test is distinct from routine PFAS analysis in that it reports a single result for a sample, representing the sum of fluorine arising from all organic fluorine substances measured, rather than individual results for different PFAS substances.

Approach/Activities. Combustion ion chromatography (CIC) is a leading technology for a widely available, high throughput, low cost approach to TOF analysis. CIC has a long history of application to organohalide analysis for chloride, bromide and iodide species. Recent advances have made it amenable to organofluoride species as well, with detection limits relevant for levels commonly encountered in environmental samples. These range from single digit ppb levels for most waters to a few tens of ppb for soils to high ppb or low ppm levels for AFFF. While the term TOF is widely used, different approaches to isolating organofluorine are in use. The approach followed in this study is adsorbable organofluorine (AOF).

Results/Lessons Learned. We have been offering TOF(AOF)-CIC analysis since mid-2020 and have learned much about the method and the equipment in that time. Our studies to determine how efficient these procedures are at extracting all PFAS from a sample have indicated some variability in extraction efficiency related to soil type and specific PFAS. Water and dilute AFFF appear to have consistently higher efficiencies than soils. We have also introduced a procedure to recognize when samples are significantly impacted by organofluorine sources other than common PFAS. Finally, DIN 38409-59:2020-11(draft), specific to TOF(AOF)-CIC analysis was released in late 2020 and recommends some modifications to the protocols described in the earlier ISO_9562_2004 method and other guidance. This talk will provide an overview of our findings in these and other areas for application of the method.