Recent Advances in the Analysis of Poly- and Per-fluoroalkylated substances (PFASs)

Kavitha Dasu (dasu@battelle.org) (Battelle Memorial Institute, Norwell, MA, USA)

Background/Objectives. Over the years, widespread detections of poly and perfluoroalkyl substances (PFASs) in different environmental and biological matrices has gained global attention. PFASs are extensively studied due to the concerns of human health effects, bioaccumulation potential, and persistence of the long-chain perfluorinated chemicals including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). Concerns over their persistence and potential toxicity have led to the increased use of PFAS alternatives (e.g., shorter-chain PFAS or entirely new chemistries), but the safety and fate information of the alternatives is scarce. The newly recognized classes of PFASs are primarily those found in aqueous film forming foams (AFFF) and are being identified and found in the environment. There is a need for emerging analytical techniques for characterizing, identifying, and quantifying the unknown chemicals in AFFF to mitigate the PFAS contamination.

Approach/Activities. Analytical methods are still evolving for PFAS analysis. Standard EPA 537.1 method is available only for drinking water for some of the PFAS analytes. However, there are no validated analytical methods for non-drinking water matrices. Recently, DoD's Quality Systems Manual 5.1 provides the most current and comprehensive set of quality standards for PFAS analysis. These standards outline specific quality processes for sample preparation, instrument calibration and analysis when working with PFAS. The known quantifiable PFASs account for only very small fraction. Therefore, emerging methods like total fluorine analysis, TOP assay and PIGE techniques can be used as the pre-screening tool for PFAS contaminated site assessments, ground water investigations and to estimate the level of PFAS contamination.

Results/Lessons Learned. Reliable, robust, and quantitative analysis of suite of PFASs in complex matrices is challenging. Recently, significant improvements in the trace level analysis of PFASs in environmental and biological matrices can be attributed to the availability of good chemical standards and their mass-labelled internal standards and avoiding the instrument background contamination. Given, there are more than 3000 PFAS related chemicals in the global market, we need a holistic approach to handle this problem. The presentation discusses the current state of knowledge on the analytical tools and the methods for the analysis of PFAS chemicals in different environmental matrices to monitor the legacy and newly identified PFASs.