Forensic Approach for PFAS Source Identification at Contaminated Sites

Kavitha Dasu (dasu@battelle.org), Larry Mullins, and
David Friedenberg (Battelle, Columbus, OH, USA)
Jonathan Thorn (Battelle, Norwell, MA, USA)

Background/Objectives. Per- and polyfluoroalkyl substances (PFAS) are widely used for many commercial and industrial applications, including their use in AFFF by DoD, oil and gas industry, manufacturing facilities, and chrome plating operations, etc. Although perfluorinated chemicals are ubiquitously present in the environment, the chemical signature of their precursors and their degradation products, information on linear and branched analogs, and chain lengths vary based on the manufacturers, intended applications, AFFF material and the age of contamination. As the number of PFAS-contaminated sites identified globally are on the rise, the need for forensic chemical fingerprinting of PFAS contamination to understand the fate and tracking the sources has grown in the past decade. Battelle is developing an approach based on the concentration and composition trends of different PFAS from various sources of contamination scenarios to find correlation between PFAS homologue profiles and their sources.

Approach/Activities. The study was designed by collecting samples from different source scenarios and some AFFF materials. All samples were analyzed using high-resolution mass spectrometry techniques (ultra-performance liquid chromatography coupled to a quadrupole time-of-flight [QTOF] mass spectrometry) in combination with PFAS targeted analysis. A library of suspected analytes was developed based on their different manufacturing sources, applications and biodegradation products. Multivariate statistical analysis was also performed to correlate the PFAS profiles to the respective sources.

Results/Lessons Learned. The results have shown that using the fingerprinting approach, we were able to correlate the sources of some of the samples collected from contaminated sites. The fingerprinting approach will be very helpful for better understanding PFAS profiles in differentiating sources of contamination at PFAS-contaminated sites.