PFAS Dark Matter: Per- and Polyfluorinated Precursors in Soil and Water

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Background/Objectives. Per- and polyfluorinated alkyl substances (PFAS) are ubiquitous, persistent, anthropogenic chemicals that bioaccumulate in both humans and biota. The toxicity of certain PFAS such as perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) has been observed in some rodent studies and the potential for deleterious effects in humans is suspected. In response to the greater understanding of the prevalence and environmental impact of these compounds that has developed recently, contaminant guidelines for selected PFAS in environmental matrices have been introduced in many jurisdictions.

While significant effort has been focused on identifying high priority impacted sites and delineating the extent of PFAS contamination, an additional consideration that is expected to influence remediation efforts is the potential for in situ oxidative transformation of PFAS *precursor* compounds to the currently current terminal PFAS of concern PFAS. The transformation of precursor compounds to terminal PFAS of concern introduces potential additional risk and liability at impacted sites. The pool of potential precursor compounds is large and poorly characterized. As a result it is difficult for stakeholders to quantify, assess and/or mitigate the potential risk posed by the presence of these precursor compounds.

Approach/Activities. In 2012 Erika Houtz and David Sedlak of the University of California, Berkeley published a laboratory-based oxidative conversion of PFAS precursors in water by persulfate thermolysis[i]. By measuring a standard suite of terminal PFAS from the same sample before and after oxidation, the presence of a potential PFAS precursor pool could be determined.

Maxxam Analytics has implemented the assay as published for water samples. A parallel assay to measure the presence PFAS precursor compounds (often referred to as PFAS "dark matter") in contaminated soils and sediments has been developed and validated by Maxxam.

Results/Lessons Learned. During this presentation, we will share our experiences and "lessons learned" during the implementation and verification of the total oxidizable precursors assay for water; and the development and validation of a reliable method for soils and sediments, including:

- Precursor conversion efficiencies and changes to chromatographic peak patterns;
- Impacts of sample heterogeneity on assay results and recommendations for controlling this impact;
- Laboratory quality assurance including sample hold time studies for both soil and water;
- Advantages and limitations of the methods.

[i] Houtz, E.F. and Sedlak, D.L. (2012). Environ. Sci. Technol., 46, 9342-9349