Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.24459

Optimizing Perfluorooctanoic Acid (PFOA) Detection in Surface Water Samples through Derivatization in Gas Chromatography Mass Spectrometry

DR. SRIMANTI DUTTAGUPTA AND AVISHEK DUTTA
University of Georgia
Presenting Author: sduttagupta@uga.edu

Per- and polyfluoroalkyl substances (PFAS) encompass a broad array of organic molecules featuring fully or partially fluorinated hydrophobic carbon chains linked to various hydrophilic functional groups. PFAS find applications in over 200 diverse sectors, varying from industrial-mining practices to food production and firefighting foams. This widespread usage is attributed to the chemical and thermal stability of the carbon–fluorine bond, along with its exceptional capability to repel both oil and water. PFAS exhibit a slow degradation rate in the environment and considered as “forever chemical” of global significance. Detection PFAS in natural systems remains relatively unexplored, with significant gaps in our understanding. Liquid chromatography-mass spectrometry has emerged as a preferred method for determining PFAS since 2001, addressing limitations of gas chromatography mass spectrometry. Currently, PFAS analysis using GC-MS remains underutilized. Nevertheless, it is crucial not to ignore the cost-effectiveness and widespread availability of GC. It can identify PFAS isomers/derivatives in environmental and biological samples due to its high-resolution capabilities. This study presents an optimized method for detecting perfluorooctanoic acid (PFOA) which belongs to the class of PFAS in surface water samples using derivatization in GC-MS, significantly enhancing the efficiency of detection. To increase the efficiency of PFOA detection, we have used N, O-bis(trimethylsilyl)trifluoroacetamide (BSTFA) and trimethylchlorosilane (TMCS) (99:1, v/v). A linearity plot correlating mass spectrometry signal with varied concentration was generated by analyzing PFOA across a dynamic range of 1–500 ng/mL, with three replicates per data point using 8860 GC, 5977B MS (Agilent Technologies®).