

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

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Total organofluorine (Total Organic Fluorine or TOF) 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 faster and less expensive option for monitoring 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.

Combustion Ion Chromatography (CIC) is currently attracting significant attention as a widely available, high throughput, low cost approach to TOF analysis. The technology has a long history of application to organohalide analysis for chloride, bromide and iodide species. Recent advances have made it amenable to organofluorine species as well, with detection limits at levels commonly encountered in environmental samples. These range from sub-part-per-billion (ppb) levels for most waters, to mid-ppb levels for soils; to high ppb or low ppm levels for AFFF.

While the term TOF is widely used, it is actually a Total Extractable Organofluorine analysis because of the sample processing that is required prior to analysis. 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 % recoveries of specific PFAS than soils.

This presentation will present an overview, with examples, of lessons learned in the development and validation this technique for environmental samples. It will also highlight other important applications for TOF analyses.

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Dr. Terry Obal is Chief Science Advisor at Bureau Veritas Laboratories. Terry's mandate is to ensure that good science and its value are fully available to our customers, regulators and the public by providing technical representation, consultative support and expert opinions for Bureau Veritas clients.

Terry has over 30 years of experience in analytical chemistry, laboratory management and environmental chemical consulting. He is currently: Chair of the Board of Directors of the Ontario Environmental Industry Association (ONEIA); Vice-Chair of the Federation of Canada's Professional Chemists (FCPC); and is an Ontario Chartered Chemist (C.Chem.) through the Association of the Chemical Profession of Ontario (ACPO).