NEW AND INNOVATIVE INSTRUMENTS IN ENVIRONMENTAL FORENSICS

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Environmental forensics utilizes analytical scientific approaches to address the release and sources of contamination within the environment. These methods often seek to reconstruct the history of deleterious environmental events, their sources, and amounts of chemicals released into the environment. Forensic methods couple well regarded scientific approaches within the legal framework. This due diligence provides tangible science based results that are important in a regulatory context, including chemical identification, transport of contaminants, and determinable operational histories. Problems environmental forensics address include: identifying sources of contamination, defining time frames of emission, and coupling observed conditions to potential sources of contamination.

Environmental forensics is at the forefront of innovation, as the present analytical trend concentrates on fieldable and portable instrumentation. Efforts to bring the lab into the field result in numerous improvements to workflow and evidence collection. New technologies being implemented allow for wide breadth of analysis at the source of contamination. Fieldable laboratories overcome the inability to bring the environment of interest, as evidence, back to the lab in sufficient quantity for a thorough analysis. This results in overall cost and time saving for the performing agency. Samples are collected and be subjected to immediate preliminary screening. This new methodology has a twofold improvement, being that only samples of concern are collected and an entire site can be thoroughly and rapidly screened. Subsequent in laboratory workload is significantly reduced as further analysis on samples have already been determined to be of evidentiary value in the field.

Portable devices have been developed to include a wide range of analytical techniques. This provides a fieldable option for a myriad of chemical analysis techniques. Spectroscopic methods include Raman, infrared, ultraviolent-visible, and cavity ringdown methods that test for a myriad of chemistries, including organic and metal contaminants. Most prevalent in the forensic community for chemical analysis is mass spectrometry (MS) methods. Portable mass spectrometers provide the precise mass analysis in the field as confirmatory tests in the laboratory. MS provides a multitude of sampling options including, surface analysis with direct analysis in real time (DART) techniques, liquid introduction, and common chromatographic methods. Environmental forensics is at the forefront of implementing new technologies. Portable and fieldable devices are poised to improve analysis and provide robust analytical methods in the field. Continued efforts and targeted applications will improve forensic methods that rapidly identify and quantify contamination, determine time frames of release, and determine anthropogenic contribution.