C42 An Adaptive Sampler for Human Scent Measurements in Field Forensics

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After attending this presentation, attendees will understand several approaches to volatile organic compound analysis in the field for forensic purposes, as well as new instrumentation developments that facilitate these analyses.

This presentation will impact the forensic community and/or humanity by demonstrating how the miniaturization of detectors will help drive the commercialization of small, low power, light-weight instruments for near real-time field analyses.

The FBI's laboratory division and other operational units within the FBI require rapid and reliable volatile organic compound (VOC) analyses in the field to assess human scent collection instrumentation and improve their overall response strategy and effectiveness for chemical vapor determinations. Trace detection of VOCs captured via scent pads or emanating from clandestine human burials in the field has been difficult and current methods rely heavily on the use of canines. Because canines are subject to exhaustion and maintenance an improved methodology for screening large areas is required.

The Counterterrorism Forensic Science Research Unit (CTFSRU) has developed a new adaptive sampling and analysis approach to trace VOCs detection for field applications. The adaptive sampler is based on the use of a front-end solid phase microextraction (SPME) array that passively extracts volatiles from large air volumes. The sampler is coupled to a microconcentrator for overall flow matching and is interfaced to a low thermal mass (LTM) gas chromatograph (GC) employing both mass spectrometric (MS) and pulsed Helium ionization detection. SPME was selected as a passive air extractor because the technique requires neither power nor solvents for sample collection or preparation, and the array device can be made compact. Trapping, desorption, and subsequent microconcentration efficiencies will be presented for quantitative VOC studies. The theoretical aspects of SPME indicate that in all but the smallest of samples, sample size (i.e., volume of water or air) does not affect the sample loading onto the fiber. However, analyte concentration and sampling conditions do affect quantitative fiber loading. Currently GC/MS is used in the laboratory to confirm the identity of a standards mix as well as a spiked scent pad; however, data from this new small, lightweight, and low power prototype sampler will be used to improve GC/MS field systems.

The laboratory division and forensic community should benefit from these method and instrumentation developments because it will help reduce the time for mixture analysis of the various organic matrices, including semivolatiles as well as volatiles, typically encountered by responders and analysts in the field.

VOCs, Scent, Adaptive Sampler

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