A178 Detecting Gravesoil from Headspace Analysis with Adsorption on Short Porous Layer Open Tubular (PLOT) Columns

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After attending this presentation, attendees will have a solid understanding of headspace analysis with adsorption on short porous layer open tubular (PLOT) columns, a technique developed recently to collect ppb levels of low volatility compounds, along with the benefits and advantages of detecting gravesoil with this technique, as well as, an example of an application of this technique to the detection of trace vapors of ninhydrin-reactive nitrogen in actual gravesoil.

This presentation will impact the forensic science community by presenting a simple and reliable technique that can be used to detect ninhydrin-reactive nitrogen in the air above gravesoil, paving the way for developing a reliable and cheap in-the-field devise for the detection of clandestine graves.

Victims of crimes are often buried in clandestine graves. While there are several methods to find bodies, none of these methods are very reliable; thus, a simple and rapid diagnostic tool for forensic detection of clandestine gravesites would be invaluable to criminal investigators. Cadaver decomposition results in the release of nitrogenous compounds into the surrounding area/dirt. Some of these nitrogenous compounds react with ninhydrin to form Ruhemann's purple, a reaction that is often used to detect latent fingerprints. Ninhydrin is low cost and readily available to law-enforcement personnel. Recently, an improved headspace analysis technique for sampling low volatility, as well as trace volatile, compounds by applying low temperature collection on short alumina-coated porous layer open tubular (PLOT) columns was developed (T.J. Bruno, "Simple Quantitative Headspace Analysis by Cryoadsorption on a Short Alumina PLOT Column" Journal of Chromatographic Science, 2009). This method was modified for the in- the-field (ambient temperature) collection of ninhydrin-reactive nitrogen from the air (headspace) above decaying rats. Frozen feeder rats were laid in individual grave boxes on top of 3 inches of dirt. Half of the rats were then covered with another two inches of dirt. Additionally, gravesites that contained only dirt (no rats) were also examined. The graves were sealed for the duration of the experiment. The headspace was sampled via piecing a PLOT column through a septum port on the lid of each grave using a pump to pull the headspace air through the PLOT column. After headspace collection, analytes that adsorbed onto the PLOT column were eluted into 0.5 mL of 2% ninhydrin reagent using 0.5 mL 2M KCl. The solution was then incubated at 100 °C for 25 minutes, diluted with 10 mL 50/50 v/v ethanol/water, and the absorbance of the solution read at 570 nm. Measurements were made over several months. Ninhydrin-reactive nitrogen was detected in each grave at each time point at levels significantly above the dirt-only graves

An in-the-field method will be presented for detecting trace quantities of ninhydrin-reactive nitrogen in the air above decaying rats and present the results from the above experiment that took place over a several month period. This work paves the way for developing a portable device for detecting clandestine graves.

Gravesite, Headspace, Adsorption

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