Evaluation of the Odor Compounds Sensed by Explosive-Detecting Canines

Lotspeich, Erica H.

Advisor: Goodpaster, John V. (John Vincent)
Siegel, Jay A.
Deo, Sapna K.

Degree: M.S.

Degree Year: 2010

Department: Chemistry & Chemical Biology

Grantor: Purdue University

Permanent Link: http://hdl.handle.net/1805/2473

Keywords: Explosive, Canine, Detection

LC Subjects: Detector dogs ; Explosives -- Detection

Date: 2011-03-09

Abstract:

Trained canines are commonly used as biological detectors for explosives; however, there are some areas of uncertainty that have led to difficulties in canine training and testing. Even though a standardized container for determining the accuracy of explosives-detecting canines has already been developed, the factors that govern the amount of explosive vapor that is present in the system are often uncertain. This has led to difficulties in comparing the sensitivity of canines to one another as well as to analytical instrumentation, despite the fact that this container has a defined headspace and degree of confinement of the explosive. For example, it is a common misconception that the amount of explosive itself is the chief contributor to the amount of odor available to a canine. In fact, odor availability depends not only on the amount of explosive material, but also the explosive vapor pressure, the rate with which the explosive vapor is transported from its source and the degree to which the explosive is confined. In order to better understand odor availability, headspace GC/MS and mass loss experiments were conducted and the results were compared to the Ideal Gas Law and Fick's Laws of Diffusion. Overall, these findings provide increased awareness about availability of explosive odors and the factors that affect their generation; thus, improving the training of canines. Another area of uncertainty deals with the complexity of the odor generated by the explosive, as the headspace may consist of multiple chemical compounds due to the extent of explosive degradation into more (or less) volatile substances, solvents, and plasticizers. Headspace (HS) and solid phase microextraction (SPME) coupled with gas chromatography/mass spectrometry (GC/MS) were used to determine what chemical compounds are contained within the headspace of an explosive as well as NESTT (Non-Hazardous Explosive for Security Training and Testing) products. This analysis concluded that degradation products, plasticizers, and taggants are more common than their parent explosive.

Description:

Indiana University-Purdue University Indianapolis (IUPUI)

Files in this item

Name: Evaluation of the ... View/Open
Size: 1.042Mb
Format: PDF
Description: Complete Thesis

This item appears in the following Collection(s)

- Chemistry & Chemical Biology Department Theses and Dissertations