



## **B115 Odor Stimuli Validation in Smokeless Powders: The Bridge Between Analytical Chemistry Approaches and Dynamic Airflow Sampling**

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**Learning Overview:** After attending this presentation, attendees will better understand how the use of automated olfactometers for odor stimuli presentation in canine detection applications can be verified with analytical chemistry techniques to provide a laboratory foundation as to the chemical composition in real time. This novel approach allows a concurrent quantitative evaluation of presented odor stimuli.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by evaluating not only the feasibility of presenting target explosive odorants using an olfactometer in olfaction exercises, but bridges instrumental validation for confirmation to understand odor chemical composition and survivability concept.

The use of biological detection is crucial within the fields of security screening and criminal investigations. Military and law enforcement personnel utilize canine teams in a range of different applications. Canine disciplines of crucial importance for homeland security purposes include that of explosive and narcotics detection. Due to the ever-changing explosive and narcotic materials encountered during routine field operations, it is imperative to have an optimal training regimen reflective of current target odor needs. Hence, the chemical understanding of target odorant concentrations and subsequent means of odor delivery are essential in the training of a canine team. There are a variety of methods available for the presentation of odor stimuli in olfactory-based exercises, with the use of dynamic airflow sampling being one common method via olfactometers to measure behavioral responses. Concurrently, the chemical characterization of explosive and narcotic materials is an excellent tool to provide valuable information that can not only better inform canine training but can also be used for field-portable technique development.

This study focuses on the use of an in-house olfactometer to test a double-based smokeless powder as a target odor stimulus. Previous work has identified derivatives of smokeless powder additives to include diphenylamine that are formed as the powder material degrades. Using this target odor volatile for study, an instrumental analysis evaluation has been performed to test target volatile after dynamic airflow sampling. Instrumental parameter optimization included analysis of optimal solid phase microextraction fiber chemistry, amount, and age of target odorant as a function of peak area response using Gas Chromatography/Mass Spectrometry (GC/MS). Studies were conducted directly over the headspace of the target odorant and using the olfactometer as the dynamic airflow device for comparison purposes. Previously established volatile organic compounds from smokeless powders were detected, and comparison between non-airflow versus airflow sampling was achieved.

The need for enhanced olfactory-based behavioral tools is essential for optimal applications of biological detectors. This study evaluates not only the feasibility of presenting target explosive odorants using an olfactometer in olfaction exercises but bridges instrumental validation for confirmation to understand odor chemical composition and survivability concepts.

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**Explosive Odorants, Olfactometer, Analytical Chemistry**