B93 The Characterization of Reloading Smokeless Powders Toward Brand Identification

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After attending this presentation, attendees will have an understanding of the value of morphology, micrometry, and instrumental methods in the brand identification of smokeless powders.

This presentation will impact the forensic community and/or humanity with the use of the database of information by providing investigators and prosecuting attorneys with the brand or a short list of brands of smokeless powder used by a bomber. Additionally, the database may be available on CD at a later time for use by other laboratories.

On completion of the presentation, the listener will have an understanding of the value of morphology, micrometry, and instrumental methods in the brand identification of smokeless powders.

By using morphology, micrometry, and other methods, unique brand identification or a short list of possible smokeless powders from an unknown powder is possible. A sample size of 148 smokeless powder brands, with a few repeats, was examined for potential identifying features such as morphology, color, texture, coating, dimensional measurement, weight, and chemical content. The questioned powder sample must contain a sufficient number of unburned powder kernels for comparison.

While the government closely monitors explosives, canisters of smokeless powders can be purchased over-the-counter by sport shooters and hunters for reloading ammunition or by bombers for improvised explosive device construction. Reloading or canister smokeless powders offer an available relatively inexpensive explosive for the criminal element. Explosive fillers from pipe bombs submitted to crime laboratories frequently contain smokeless powder.

Providing smokeless powder brand identification information to an investigator can assist in the investigation or trial of a bombing suspect. Smokeless powders were subjected to different methods of analysis to build a library database for future comparisons for brand identification or provide a selective list of possible powders.

Macroscopic and microscopic features were noted. Unless a unique identifier, such as a colored 'dot', was present the macro-scale examination could not produce a single, unique brand. Using a stereomicroscope with a digital camera and semi-automated measurement software, at least 25 random kernels (and up to 100 random kernels) from each of the 148 samples were measured for their relevant dimensions. Use of micro-morphology and other microscopical features to categorize the powders eliminated significant non-conforming brands for further comparison. Micrometry measurements were statistically evaluated against like morphology. The dimensional parameters were treated to Bonferoni-Dunn statistical analysis. The standard T-test was rejected because it is used for one-against-one comparisons while Bonferoni-Dunn provides one against many, taking into account the effect of multiple comparisons. Often characterization of features such as micro-morphology, color, texture, and coating, along with dimensional measurements permitted unique or limited number of possible smokeless powder brands. The mass of sample of the various powder brands using triplicate samples of 50 kernels at a time for measurement further characterized the powders. Gas chromatography with mass spectrometry was used to characterize the smokeless powders with positive results. Of the 148 samples characterized, most brands could be identified uniquely while some samples resulted in a short list of possible brands. Chemical content was able to resolve several of these.

Smokeless Powder, Morphology, Micrometry

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