



Standard Practice for Characterization and Classification of Smokeless Powder¹

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1. Scope

1.1 This practice describes procedures for characterization and analysis of smokeless powders recovered from explosives incidents (**1**, **2**),² materials or objects containing gunshot residue (**3**) when visible grains are present, or bulk samples of powder.

1.2 Smokeless powder is characterized by shape, color, texture, manufacturing toolmarks, markers, dimensional measurements, and chemical composition (**4-6**).

1.3 Smokeless powder is an energetic material classified as a low explosive or propellant. Smokeless powder can be further classified as single-base, double-base, or triple-base.

1.4 Analysis of post-blast debris and items containing gunshot residue when visible grains of smokeless powder are not present is beyond the scope of this practice.

1.5 This practice will provide guidelines for the analysis of organic components of smokeless powders using various instrumental techniques, such as gas chromatography-mass spectrometry, liquid chromatography, and Fourier transform infrared spectroscopy.

1.6 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.7 *This standard involves handling of low explosives and potentially other energetic materials. It is strongly suggested that an analyst be trained in the storage and safe handling of energetic materials and be familiar with the properties and hazards of explosives.*

1.8 *This standard cannot replace knowledge, skill, or ability acquired through appropriate education, training, and experience and should be used in conjunction with sound professional judgment.*

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate*

safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 *ASTM Standards:*³

E620 Practice for Reporting Opinions of Scientific or Technical Experts

E1492 Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory

E1618 Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *ball powders, n*—a class of smokeless powders produced by a process where the final grain morphologies are spherical, flattened-ball, or flake.

3.1.2 *double-base, n*—propellant containing nitrocellulose and nitroglycerin.

3.1.3 *deterrent, n*—a compound to slow the burning rate of a powder.

3.1.4 *energetic, n*—an explosive compound used to enhance the burning rate of a powder.

3.1.5 *extruded powders, n*—a class of smokeless powders produced by an extrusion process where the final grain morphologies are disc or cylinder.

3.1.6 *grain, n*—an individual particle of smokeless powder.

3.1.7 *marker, n*—a colored grain of smokeless powder to assist in the visual identification of a bulk reloading smokeless powder.

3.1.8 *perforation, n*—a hole in a disc powder or one or more holes running through the length of a cylinder powder created during the manufacturing process in extruded powders.

3.1.9 *single-base, n*—propellant containing nitrocellulose as the major energetic material.

¹ This practice is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.01 on Criminalistics.

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² The boldface numbers in parentheses refer to a list of references at the end of this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.