



Standard Test Method for Determination of Loose and Tapped Bulk Density of Plutonium Oxide¹

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1. Scope

1.1 This test method specifies a method for the determination of loose and tapped bulk density of plutonium oxide powder.

1.2 This test method is applicable when limited quantities of powder are available for performance of the measurements. Alternative test methods, such as Test Methods [B527](#) or [D7481](#), may be used when sufficient quantities are available.

1.3 This test method contains notes that are explanatory and are not part of the mandatory requirements of the method.

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

1.5 *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. Some specific hazards statements are given in Section 7 on Hazards.*

2. Referenced Documents

2.1 ASTM Standards:²

- [B527](#) Test Method for Determination of Tap Density of Metallic Powders and Compounds
- [C859](#) Terminology Relating to Nuclear Materials
- [D3766](#) Terminology Relating to Catalysts and Catalysis
- [D6393](#) Test Method for Bulk Solids Characterization by Carr Indices
- [D7481](#) Test Methods for Determining Loose and Tapped Bulk Densities of Powders using a Graduated Cylinder
- [E135](#) Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials

¹ This test method is under the jurisdiction of ASTM Committee [C26](#) on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee [C26.05](#) on Methods of Test.

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² 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.

[E1272](#) Specification for Laboratory Glass Graduated Cylinders

3. Terminology

3.1 For definitions of terms used in this test method but not defined herein, refer to Terminologies [C859](#) and [E135](#).

3.2 Definitions:

3.2.1 *bulk density, n*—ratio of the mass of a collection of discrete pieces of solid material to the sum of the volumes of: the solids in each piece, the voids within the pieces, and the voids among the pieces of the particular collection. **D3766**

3.2.2 *loose bulk density, n*—bulk density that results from pouring the powder into a heap or container in the absence of any applied compression. **D7481**

3.2.3 *tapped bulk density, n*—bulk density resulting from the application of compression, for example, impact or vibration. **D7481**

4. Summary of Test Method

4.1 Loose bulk density is determined by measuring the volume of a known mass of plutonium oxide powder poured into a graduated cylinder with a capacity of 10, 25, 50, or 100 cm³. The cylinder size should be selected based on the amount of plutonium oxide powder available for the test.

4.2 The cylinder is then mechanically tapped at a dropping height of 3 mm for 2 min at 250 taps per minute, and the resulting volume is then measured. This process is repeated for cycles of 2 min until the difference in tapped volumes is less than 2 %.

5. Significance and Use

5.1 This test method is intended for determination of bulk loose or tapped density or both for plutonium oxide or similar metallic powders or compounds in the nuclear industry. It is intended for use when the quantity of available material for performing the measurements is limited because of reasons such as nuclear safety or laboratory scale limits on nuclear inventory.

5.2 Values of loose bulk density obtained using this test method should be used with caution since they can vary considerably depending on the initial state of dispersion of the