



Standard Test Method for Particle Size Distribution of Metal Powders and Related Compounds by X-Ray Monitoring of Gravity Sedimentation ¹

This standard is issued under the fixed designation B 761; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope *

1.1 This test method covers the determination of particle size distributions of metal powders. Experience has shown that this test method is satisfactory for the analysis of elemental tungsten, tungsten carbide, molybdenum, and tantalum powders, all with an as-supplied Fisher number of 6 μm or less, as determined by Test Method B 330. Other metal powders (for example, elemental metals, carbides, and nitrides) may be analyzed using this test method with caution as to significance until actual satisfactory experience is developed (see 7.2). The procedure covers the determination of particle size distribution of the powder in the following two conditions:

1.1.1 As the powder is supplied (as-supplied), and

1.1.2 After the powder has been deagglomerated by rod milling as described in Practice B 859.

1.2 This test method is applicable to particles of uniform density and composition having a particle size distribution range of 0.1 up to 100 μm.

1.2.1 However, the relationship between size and sedimentation velocity used in this test method assumes that particles sediment within the laminar flow regime. This requires that the particles sediment with a Reynolds number of 0.3 or less. Particle size distribution analysis for particles settling with a larger Reynolds number may be incorrect due to turbulent flow. Some materials covered by this test method may settle with Reynolds number greater than 0.3 if particles greater than 25 μm are present. The user of this test method should calculate the Reynolds number of the largest particle expected to be present in order to judge the quality of obtained results. Reynolds number (Re) can be calculated using the flowing equation

$$Re = \frac{D^3(\rho - \rho_0)\rho_0 g}{18\eta^2} \quad (1)$$

where

D = the diameter of the largest particle expected to be present,

ρ = the particle density,

ρ_0 = the suspending liquid density,

g = the acceleration due to gravity, and

η = is the suspending liquid viscosity.

A table of the largest particles that can be analyzed with Reynolds number of 0.3 or less in water at 35°C is given for a number of metals in Table 1. A column of the Reynolds number calculated for a 30-μm particle sedimenting in the same liquid system is given for each material also.

1.3 *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. Specific hazard information is given in Section 7.*

2. Referenced Documents

2.1 ASTM Standards:

B 330 Test Method for Average Particle Size of Powders of Refractory Metals and Their Compounds by the Fisher Sub-Sieve Sizer²

B 821 Guide for Liquid Dispersion of Metal Powders and Related Compounds for Particle Size Analysis²

B 859 Practice for De-agglomeration of Refractory Metal Powders and Their Compounds Prior to Particle Size Analysis²

E 456 Terminology Related to Quality and Statistics³

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method³

3. Summary of Test Method

3.1 A carefully dispersed homogeneous suspension of the powder is permitted to settle in a cell scanned by a collimated X-ray beam of constant intensity. The net X-ray signal is inversely proportional to the sample concentration in the

¹ This test method is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.03 on Refractory Metal Powders.

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² Annual Book of ASTM Standards, Vol 02.05.

³ Annual Book of ASTM Standards, Vol 14.02.