



Designation: ~~B821-02 (Reapproved 2007)~~ Designation: B821 - 10

Standard Guide for Liquid Dispersion of Metal Powders and Related Compounds for Particle Size Analysis¹

This standard is issued under the fixed designation B821; 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 guide covers the dispersion in liquids of metal powders and related compounds for subsequent use in particle size analysis instruments. This guide describes a general procedure for achieving and determining dispersion; it also lists procedures that are currently in general use for certain materials.

1.2 This guide is limited to metal powders and related metal compounds. However, the general procedure described herein may be used, with caution as to its significance, for other particulate materials, such as ceramics, pigments, minerals, etc.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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:*²

B243 [Terminology of Powder Metallurgy](#)

B430 [Test Method for Particle Size Distribution of Refractory Metal Powders and Related Compounds by Turbidimetry](#)

B761 [Test Method for Particle Size Distribution of Metal Powders and Related Compounds by X-Ray Monitoring of Gravity Sedimentation](#)

B822 [Test Method for Particle Size Distribution of Metal Powders and Related Compounds by Light Scattering](#)

3. Terminology

3.1 *Definitions*—Definitions of powder metallurgy terms can be found in Terminology B243.

4. Significance and Use

4.1 The method of powder dispersion in a liquid has a significant effect on the results of a particle size distribution analysis. The analysis will show a too-coarse, unstable, or nonrepeatable distribution if the powder has not been dispersed adequately. It is therefore important that parties wishing to compare their analyses use the same dispersion technique.

4.2 This guide provides established powder dispersion techniques for certain materials and the means of deriving techniques for materials not listed. It should be used by all parties performing liquid-dispersed particle size analysis of all of the materials covered by this guide (see 1.1, 1.2, and 4.1).

4.3 This guide should be used in the preparation of powders for use in Test Methods B430, B761, and B822 and other procedures that analyze metal powder particle size distributions in liquid-dispersed systems.

5. Apparatus

5.1 *Microscope*, suitable for observation of particles in the size range of 5 to 1000 μm .

5.2 *Ultrasonic Probe*, $\frac{1}{2}$ -in. (25.4-mm) tip, with the power level to be determined by this guide.

5.3 *Ultrasonic Bath*—Power level to be determined by this guide.

¹ This guide is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.02 on Base Metal Powders.

Current edition approved Oct. 1, 2007. Published October 2007. Originally approved in 1992. Last previous edition approved 2002 as B821-02. DOI: 10.1520/B0821-02R07.

Current edition approved Sept. 1, 2010. Published September 2010. Originally approved in 1992. Last previous edition approved 2007 as B821-02(2007). DOI: 10.1520/B0821-10.

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.

*A Summary of Changes section appears at the end of this standard.

TABLE 1 Recommended Dispersion Procedures

Material	Carrier Liquid	Surfactant	Surfactant Concentration	Ultrasonic Treatment		
				Type	Power Level, W	Time, min
Chromium carbide	water	none	...	none or ^A
Copper	water	Tween 21 ^B	3–5 drops ^C	bath	25	5
				bath	80	1
Ferroalloys	isopropyl alcohol	Tween 21 ^B	10 %	bath	80	1
Iron/steel	water	Tween 21 ^B	3–5 drops ^C	bath	80	1
Manganese sulfide	water	Tween 21 ^B	3–5 drops ^C	bath	80	1
Molybdenum	water	sodium hexametaphosphate	0.01 %	probe	160	3
				or		
				bath	80	10
Nickel	water	Tween 21 ^B	3–5 drops ^C	bath	25	5
				bath	80	1
Tantalum	water	sodium hexametaphosphate	0.01 %	probe	160	3
				or		
				bath	80	10
Tantalum carbide	water	sodium hexametaphosphate	0.01 %	probe	160	3
				or		
				bath	80	10
Tungsten	water	sodium hexametaphosphate	0.01 %	bath	25	5
				probe	160	3
				or		
Tungsten carbide	water	sodium hexametaphosphate	0.01 %	bath	80	10
				or		
				probe	160	3
Tungsten carbide	water	sodium hexametaphosphate	0.01 %	or		
				bath	80	10
Tungsten carbide	water	sodium hexametaphosphate	0.01 %	or ^A		
				bath	25	5

^A As described in Test Method B430.

^B Tween 21, chemically known as polyoxyethylene⁶ sorbitan monolaurate, is manufactured by Croda International PLC, and is available from ICI Americas, Inc.; Specialty Chemicals Division, Murphy and Concord Pike, Wilmington, DE 19887.

^C Three to five drops Tween 21 in 30 to 50 mL water.

6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals should be used in all tests. Unless otherwise indicated, it is intended that all reagents should conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society.³ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Surfactants*—Suggested surfactants are listed in Table 1 and footnotes 4 through 6.^{4,5,6}

³ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

⁴ Allen, T., *Particle Size Measurement*, 4th Edition, Chapman and Hall, London, UK, 1991.

⁵ Nelson, R. D., *Dispersing Powders in Liquids*, Elsevier, New York, NY, 1988.

⁶ *SediGraph 5100 Windows Software Operator's Manual*, Micromeritics Corporation, Norcross, GA, 1998, pp. C-1, C-2, H-1, and H-2; *SediGraph III 5120 Operator's Manual*, Micromeritics Corporation, Norcross, GA, 1998, pp. C-3, C-4, and H-3.