



Standard Guide for Significance of Particle Size Measurements of Coating Powders¹

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1. Scope

1.1 This guide covers the significance of referencing the techniques used whenever specifying the particle size distribution of a coating powder.

2. Referenced Documents

2.1 ASTM Standards:

D 1921 Test Methods for Particle Size (Sieve Analysis) of Plastic Materials²

D 3451 Guide for Testing Coating Powders and Powder Coatings³

3. Terminology

3.1 Definitions:

3.1.1 *coating powders*—these are finely divided particles of organic polymer that generally contain pigments, fillers, and additives and that remain finely divided during storage under suitable conditions.

3.1.2 *powder coatings*—these are coatings that are protective, decorative, or both; and that are formed by the application of a coating powder to a substrate and fused into continuous films by the application of heat or radiant energy.

4. Significance and Use

4.1 This guide describes the need to specify the measuring technique used whenever quoting the particle size distribution of a coating powder.

4.2 This guide is for use by manufacturers of coating powders and by specifiers for process control and product acceptance.

5. Particle Size of Coating Powders

5.1 The size of the particles comprising a coating powder plays a critical role in the fluidization, application, and reclamation of the powder, and in the final appearance of the coated part. Coating powders are comprised of particles of widely differing sizes, from as low as about 1 μm to as high as about

150 μm. Collectively, the individual particles form a size distribution, defined by the percentages of particles present of a given size or within a given size range. There are generally few particles at the low and high ends of the distribution, the majority being in the 25 to 65-μm range. The distribution can be described by an actual plot of the particle size distribution, or by numerical attributes of the distribution, such as the calculated values of its mean, median or mode. The mean represents the average particle size (the sum of all the particle sizes divided by the number of particles). The median represents a size such that half the particles are larger than it and half the particles are smaller than it. The mode represents the most frequently occurring particle size. For all coating powders these three figures are numerically different.

5.2 The particle size distribution is generally chosen by the coating powder manufacturer from knowledge of the application technique, the required cured film thickness, surface appearance, and performance. Once the desired particle size distribution has been selected, it needs to be monitored to ensure consistency from batch to batch and, indeed, within each batch. Occasionally the coating powder applicator may specify the particle size from knowledge of the specific application equipment or customer requirements, or both.

5.3 It is important for all involved to understand that the numerical data comprising a particle size distribution are significantly dependent on the technique used to obtain them. It is, therefore, of little use to quote or specify a particle size distribution, and even less a single particle size, without also defining the technique used to obtain that measurement, or, if a single size, whether it is, for example, the mean, median or modal value.

6. Measurement of Particle Size

6.1 There are a wide variety of instruments currently available for measuring the particle size distributions of coating powders. Actual sieving, such as described in Test Methods D 1921, where the percentage weight of coating powder retained on sieves of known mesh size is measured, is relatively inexpensive and direct. It is, however, significantly slower than indirect measurement techniques, such as laser scattering and electrolytic conductivity, such as described in Guide D 3451. With indirect measurement techniques, a secondary effect, induced by the presence of the coating powder

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 06.02.