



Standard Test Method for Measuring the Minimum Fluidization Velocities of Free Flowing Powders¹

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1. Scope

1.1 This test method describes the apparatus and procedure needed for determining the minimum fluidization velocity of Geldart Group A powders and the minimum fluidization or complete fluidization velocity of Geldart Group B powders.

1.1.1 This test method is for powders that are readily or easily fluidizable and fall into the category of Group A and B of the “Geldart” classification. The fluidization of Geldart Group C powders will be addressed in another standard. This test method could apply to Geldart Group D particles but the focus of this document is towards Group A and B materials.

1.1.2 Geldart classification of powders is often defined by comparing the Sauter mean particle size with the difference between the particle density and the density of the fluidizing gas, as illustrated in Fig. 1(1).²

1.1.2.1 Group A powders are easily fluidized but there is a difference between the gas velocity where the bed is initially fluidized and the velocity where bubbles are first observed. For Group A powders, bed expansion can be considerable before any bubbles are observed. Group B powders are also easily fluidized; but there is no difference between the velocity where the bed is fluidized and the velocity at the onset of bubbling. The minimum gas velocity, where all of the particles are fully supported by the gas for Group B powders, is often referred to as the “complete fluidization velocity” instead of minimum fluidization velocity. Group C powders are cohesive and can be difficult to fluidize.

1.1.2.2 Group A powders can be distinguished from Group B powders by the response to deaeration. Group A powders deaerate relatively slowly whereas Group B powders deaerate almost instantaneously in fluidized beds.

1.1.2.3 Group A Powders that lie near or on the Group A/C boundary may be tested by this method. However, if the powders do not fluidize freely, test results should be considered invalid.

1.1.2.4 Temperature, moisture (water) content, particle size distribution, particle shape and sometimes other variables influence the Geldart classification of a powder. Deaeration testing specified in 1.1.2.2 is a more definitive test than simply using particle size and density differences as described in 1.1.2.

NOTE 1—A Standard Practice for deaeration testing is under development.

1.2 This test method should be performed in a laboratory under controlled conditions of temperature and humidity.

1.3 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026.

1.3.1 The procedures used to specify how data are collected/recorded or calculated, in this standard are regarded as the industry standard. In addition they are representative of the significant digits that generally should be retained. The procedures used do not consider material variations, the purpose for obtaining the data, special purpose studies, or any considerations for the user’s objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analysis methods for engineering design.

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 This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.24 on Characterization and Handling of Powders and Bulk Solids.

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