



Standard Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Scanning Electron Microscopy¹

This standard is issued under the fixed designation D 6059; 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 sampling methods and analysis techniques used to assess the airborne concentration and size distribution of single-crystal ceramic whiskers (SCCW), such as silicon carbide and silicon nitride, which may occur in and around the workplace where these materials are manufactured, processed, transported, or used. This test method is based on the collection of fibers by filtration of a known quantity of air through a filter. The filter is subsequently evaluated with a scanning electron microscope (SEM) for the number of fibers meeting appropriately selected morphological and compositional criteria. This test method has the ability to distinguish among many different types of fibers based on energy dispersive X-ray spectroscopy (EDS) analysis. This test method may be appropriate for other man-made mineral fibers (MMMMF).

1.2 This test method is applicable to the quantitation of fibers on a collection filter that are greater than 5 µm in length, less than 3 µm in width, and have an aspect ratio equal to or greater than 5:1. The data are directly convertible to a statement of concentration per unit volume of air sampled. This test method is limited by the diameter of the fibers visible by SEM (typically greater than 0.10 to 0.25 µm in width as determined in 12.1.5) and the amount of coincident interference particles.

1.3 A more definitive analysis may be necessary to confirm the presence of fibers with diameters ≤0.10 to 0.25 µm in width. For this purpose, a transmission electron microscope (TEM) is appropriate. The use of the TEM method for the identification and size measurement of SCCW is described in Practice D 6058 and Test Method D 6056.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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.

2. Referenced Documents

2.1 ASTM Standards:

- D 1193 Specification for Reagent Water²
- D 1356 Terminology Relating to Sampling and Analysis of Atmospheres³
- D 4532 Test Method for Respirable Dust in Workplace Atmospheres³
- D 6056 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Transmission Electron Microscopy³
- D 6057 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Phase Contrast Microscopy³
- D 6058 Practice for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment³
- E 691 Practice for Conducting Interlaboratory Study to Determine the Precision of a Test Method⁴
- E 766 Practice for Calibrating the Magnification of SEM Using NBS SRM 484⁵

3. Terminology

3.1 Definitions:

3.1.1 *analytical sensitivity, n*—airborne fiber concentration represented by a single fiber counted in the SEM.

3.1.1.1 *Discussion*—Although the terms *fiber* and *whisker* are, for convenience, used interchangeably in this test method, whisker is correctly applied only to single-crystal fibers whereas a "fiber" may be single- or poly-crystalline or may be noncrystalline.

3.1.2 *aspect ratio, n*—the ratio of the length of a fiber to its width.

¹ This test method is under the jurisdiction of ASTM Committee D22 on Sampling and Analysis and is the direct responsibility of Subcommittee D22.04 on Workplace Atmospheres.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 11.03.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ *Annual Book of ASTM Standards*, Vol 03.01.

