



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

This standard is issued under the fixed designation D 6056; 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 filtration of a known quantity of air through a filter. The filter is subsequently evaluated with a transmission electron microscope (TEM) for the number of fibers meeting appropriately selected morphological and compositional criteria. This test method has the ability to distinguish among different types of fibers based on energy dispersive X-ray spectroscopy (EDS) analysis and selected area electron diffraction (SAED) 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 0.5 μm in length, less than 3 μm in width, and have an aspect ratio equal to or greater than 5:1 (**1**).² The data are directly convertible to a statement of concentration per unit volume of air sampled. This test method is limited by the amount of coincident interference particles.

1.3 The values stated in SI 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:

- D 1193 Specification for Reagent Water³
- D 1356 Terminology Relating to Sampling and Analysis of Atmospheres⁴
- D 4532 Test Method for Respirable Dust in Workplace Atmospheres⁴
- D 6057 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Phase Contrast Microscopy⁴
- D 6058 Practice for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment⁴
- D 6059 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Scanning Electron Microscopy⁴
- E 691 Practice for Conducting Interlaboratory Study to Determine the Precision of a Test Method⁵

3. Terminology

3.1 Definitions:

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

3.1.1.1 *Discussion*—Although the terms *fiber* and *whisker* are, for convenience, used interchangeably in this test method, whiskers 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.

3.1.3 *fiber, n*—for the purpose of this test method, an elongated particle having a minimum length of 0.5 μm, a width less than 3 μm, and an aspect ratio equal to or greater than 5:1.

3.1.4 *fibrous, adj*—composed of parallel, radiating, or interlaced aggregates of fibers, from which the fibers are sometimes

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

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 11.03.

⁵ *Annual Book of ASTM Standards*, Vol 14.02.

