



Designation: D6058 – 96 (Reapproved 2006)

# Standard Practice for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment<sup>1</sup>

This standard is issued under the fixed designation D6058; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice is intended to assist individuals in the sampling and analysis of single-crystal ceramic whiskers (SCCW), such as silicon carbide and silicon nitride, in the workplace environment. It describes sampling and analytical techniques used to assess the airborne concentration and size distribution of SCCW, which may occur in and around the workplace where these materials are manufactured, processed, transported, or used.

1.2 The protocols currently in use for asbestos and other fibrous materials have been used as a guide in developing sampling and analytical procedures for characterizing fibers produced from the manufacture and use of SCCW. The sampling and analysis protocols described here have been written specifically for SCCW, however, they may be appropriate for other man-made mineral fibers (MMMMF).

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:*<sup>2</sup>

[D1356 Terminology Relating to Sampling and Analysis of Atmospheres](#)

[D6056 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Transmission Electron Microscopy](#)

[D6057 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace](#)

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.04 on Workplace Atmospheres.

Current edition approved Oct. 1, 2006. Published October 2006. Originally approved in 1996. Last previous edition approved in 2001 as D6058 - 96 (2001). DOI: 10.1520/D6058-96R06.

<sup>2</sup> 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.

[Environment by Phase Contrast Microscopy](#)

[D6059 Test Method for Determining Concentration of Airborne Single-Crystal Ceramic Whiskers in the Workplace Environment by Scanning Electron Microscopy](#)

## 3. Terminology

3.1 For definitions of terms used in this practice, refer to Terminology [D1356](#).

3.2 *Definitions:*

3.2.1 *man-made mineral fiber, n*—any inorganic fibrous material produced by chemical or physical processes.

3.2.2 *single-crystal ceramic whisker, n*—a man-made mineral fiber that has a single-crystal structure.

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

## 4. Summary of Practice

4.1 This practice is based on a three-tier approach to the quantitative assessment of airborne SCCW levels. It includes detailed procedures to analyze standard air sampling cassettes by phase contrast microscopy (PCM), scanning electron microscopy (SEM), and transmission electron microscopy (TEM).

4.2 The choice of a particular analytical method shall be based on the visibility limitation of each instrument and an understanding of the actual size distribution of the fibers being analyzed.

4.3 In general, PCM is suitable for the analysis of fibers that are greater than approximately 0.25  $\mu\text{m}$  in diameter. Depending on the instrument and the sample preparation method used, the SEM may be capable of examining fibers as small as 0.10  $\mu\text{m}$  in diameter. TEM has been shown to be suitable for the study of even finer fibers. The high resolution of this instrument makes it well suited for the determination of the fraction of a fiber population with diameters  $\leq 0.10$  to 0.25  $\mu\text{m}$ .

4.4 In addition to an enhanced image resolution, SEM and TEM have the further advantage of providing elemental composition information on a single fiber. Furthermore, TEM may also be used to ascertain crystallographic data on the fiber.