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Standard Guide for Selection and Use of Personal Protective Equipment for Humans Working With Respirable Silicon Carbide Whiskers[1]

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1. Scope

1.1 This guide describes special considerations for selection and use of personal protective devices for work situations that present a risk of exposure to respirable silicon carbide whiskers.

1.2 This guide is intended to provide supplementary information for equipment selection and use and does not take the place of other standards and requirements such as OSHA regulations, ANSI standards, manufacturer recommendations as listed on material safety data sheets, or other ASTM standards that relate to personal protective equipment.

1.3 *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:*

E 1437 Practice for Handling Silicon Carbide Whiskers[2]

E 1451 Guide for Disposal of Wastes Containing Silicon Carbide Whiskers and Fibers[2]

2.2 *OSHA Standard:*[3]

Title 29 CFR 1910 Personal Protective Equipment, Subpart 1

2.3 *ANSI Standard:*[4]

Z88.2 Respiratory Protection

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *respirable silicon carbide whiskers*—a crystalline silicon carbide material, approximately cylindrical in shape, with an aspect ratio equal to or greater than 5, and a diameter less than or equal to 3.0 µm with the potential to become airborne.

3.1.2 *HEPA*—high-efficiency filtration, tested to be 99.97 % efficient for 3.0-µm test particles.

4. General Considerations for Selection and Use of Protective Devices

4.1 Where feasible, protective devices should be selected that have a color that contrasts with the silicon carbide whiskers (or the whisker-containing materials). Practice E 1437 is recommended for guidance in handling silicon carbide whiskers.

4.2 Outer garments should be selected for their ability to withstand penetration of whiskers.

4.3 Outer garments should be easy to decontaminate or should be disposable.

4.4 Contaminated protective equipment should be stored or disposed of in a manner that will prevent or minimize the spread of whiskers to street clothing or to other work areas. Guide E 1451 should be reviewed for guidance on waste disposal.

4.5 Prior to removing visibly contaminated equipment, whisker contamination should be removed, to the extent possible, with HEPA vacuum cleaner or by wet wiping. In cases where protective clothing is heavily contaminated with whisker materials, respiratory protection should be worn until outer garments are wiped or vacuumed off.

4.6 In situations where contaminated equipment is handled by persons other than the user (for example, laundry workers), these individuals should be provided with hazard information such as that contained in the material safety data sheet.

4.7 Engineering controls such as well-designed local exhaust ventilation systems and use of enclosed systems are preferable to use of personal protective equipment for preventing personnel exposures.

5. Protective Equipment for Low-Level Contact/ Exposures

NOTE 1—Below 0.2 whiskers per cubic centimetre of air; example, laboratory use.

5.1 For tasks that are judged or known to result in incidental exposures below 0.2 whiskers per cubic centimetre, the minimum respiratory protection of a half-mask air purifying respirator with HEPA filter is recommended. ANSI Z88.2 is recommended as a guide.

5.2 Plastic or rubber types of gloves are recommended to prevent skin contact. In situations that require continuous use of gloves for more than 30-min periods, it is recommended that

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[2] *Annual Book of ASTM Standards*, Vol 11.03.

[3] Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

[4] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

gloves lined with a water (sweat) absorbing material be selected.

5.3 Body coverings should be selected to prevent contamination of workers' clothes and skin. For many laboratory situations, laboratory coats or aprons would provide sufficient protection.

5.4 Eye and face protection is suggested for tasks that present the risk of contact to those areas. Safety glasses, goggles, or face shields should provide adequate protection.

6. Protective Equipment for Higher-Level Exposures

6.1 *Respiratory Protection*—Respiratory protection should be selected based on the anticipated exposure level as follows:

6.1.1 For exposures not greater than two whiskers per cubic centimetre, the minimum recommended form of respirator is a half-mask respirator with high efficiency (HEPA) filters.

6.1.2 For exposures that do not exceed ten whiskers per cubic centimetre, the minimum recommended type of respirator is a full-facepiece respirator with high efficiency (HEPA) filters.

6.1.3 For exposures that do not exceed 20 whiskers per cubic centimetre, the minimum recommended type of respirator is the full facepiece powered air purifying respirator with high efficiency (HEPA) filters.

6.1.4 For exposures that exceed 20 whiskers per cubic centimetre, a supplied air respirator operated in the pressure demand mode should be worn.

6.1.5 Respirators should be provided in conjunction with an effective respiratory protection program which complies with OSHA Regulation 29 CFR 1910.134.

6.2 Full-body coverings should be used by employees to prevent unnecessary contact with whiskers. Use of body coverings can help to prevent spread of whiskers to other work areas when the contaminated coverings are retained in the whisker work area.

6.3 Prior to leaving a whisker work area, visible contamination should be removed with HEPA vacuum cleaners or wet wiping, or the clothing may be removed.

6.4 At the end of a use cycle (for example, end of a shift), used contaminated clothing should be bagged for disposal or decontamination. The bags should be labeled as indicated in 4.4.

6.5 For highly contaminated work areas a procedure should be developed to ensure that workers do not inadvertently spread whiskers to their homes or to other work areas. It is suggested that showers be used and that storage of clean street clothing be segregated from contaminated work clothing.

7. Keywords

7.1 fiber; man-made mineral fiber; personal protective equipment; protective equipment; respirator; silicon carbide whiskers; whisker