



Standard Practice for Determining Vacuum Chamber Gaseous Environment Using a Cold Finger¹

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1. Scope

1.1 This practice covers a technique for collecting samples of materials that are part of the residual gas environment of an evacuated vacuum chamber. The practice uses a device designated as a “cold finger” that is placed within the environment to be sampled and is cooled so that constituents of the environment are retained on the cold-finger surface.

1.2 The practice covers a method for obtaining a sample from the cold finger and determining the weight of the material removed from the cold finger.

1.3 The practice contains recommendations as to ways in which the sample may be analyzed to identify the constituents that comprise the sample.

1.4 By determining the species that constitute the sample, the practice may be used to assist in defining the source of the constituents and whether the sample is generally representative of samples similarly obtained from the vacuum chamber itself.

1.5 This practice covers alternative approaches and usages to which the practice can be put.

1.6 The degree of molecular flux anisotropy significantly affects the assurance with which one can attribute characteristics determined by this procedure to the vacuum chamber environment in general.

1.7 The temperature of the cold finger significantly affects the quantity and species of materials collected.

1.8 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.9 *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 applica-*

bility of regulatory limitations prior to use. For specific warning statements, see Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*²

E177 *Practice for Use of the Terms Precision and Bias in ASTM Test Methods*

3. Terminology

3.1 *pretest cold finger sample residue mass, M_i* —the mass of material collected from the cold finger during the pretest operation and as measured by the techniques specified in Section 9. The mass is based on a sample volume of 50 mL.

3.2 *posttest stock sample residue mass, M_f* —the mass of residue in a sample collected from the cold finger during the posttest operation and as measured by the technique specified in Section 9. The mass is based on a sample volume of 50 mL.

3.3 *pretest stock sample residue mass, S_i* —the mass of residue in a sample of the solvent (used to obtain the pretest cold finger sample) as measured by the technique specified in Section 9. The mass is based on a sample volume of 50 mL.

3.4 *posttest stock sample residue mass, S_f* —the mass of residue in a sample of the solvent (used to obtain the posttest cold finger sample) as measured by the technique specified in Section 9. The mass is based on a sample volume of 50 mL.

3.5 *cold finger*—the device that is used in collecting the sample of the residual gases in an evacuated vacuum chamber (see Fig. 1).

3.6 *CFR*—the residue collected by the cold finger during the vacuum exposure given in milligrams.

4. Summary of Practice

4.1 The cold-finger technique provides a method for characterizing the ambiance in a vacuum chamber when the chamber is being operated with or without a test item.

¹ This practice is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination.

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² 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.