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STANDARD

ANSI/ASHRAE Standard 145.1-2015
(Supersedes ANSI/ASHRAE Standard 145.1-2008)

Laboratory Test Method for Assessing the Performance of Gas-Phase Air-Cleaning Systems: Loose Granular Media

Approved by ASHRAE on March 31, 2015, and by the American National Standards Institute on April 1, 2015.

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NOTE

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FOREWORD

The air around us may contain a variety of undesirable contaminants in gaseous form. Concentrations of these contaminants may vary from trace amounts to toxic levels, and at certain concentrations contaminants may become a problem for people and equipment. Impacts on occupants may include noxious odor, physical irritation, and adverse affects on health, while equipment may be affected by corrosion. When problem concentrations are present in the air-distribution system of a heating, ventilating, and air-conditioning (HVAC) system, removal may be necessary to protect building occupants; HVAC system components; building furnishings or stored materials; and industrial/manufacturing equipment, processes, or products.

Gaseous air contaminants can be removed by various air-cleaning processes. The most common removal process employs physical adsorption with or without chemical reaction using filtration media in granular (pellet) form in particle sizes ranging from 4 to 12 mesh in the U.S. sieve series (0.187 to 0.661 in. [1.68 to 4.76 mm]). Such media include plain (untreated) or chemically impregnated activated carbons and activated aluminas, other adsorbent materials, and catalysts. These media are those generally used in the gas-phase air-cleaning equipment most often selected for use in a building HVAC system. ASHRAE Standard 145.1 provides a performance test method for this form of media and is not intended to test the performance of flat media (e.g., carbon-impregnated fibers). The results obtained here cannot be used to predict the performance of sorptive media gas-phase air-cleaning devices or installed systems.

This standard outlines a test procedure with quality control constraints to develop a performance metric using percent removal efficiency and removal capacity of a small media sample when it is challenged under steady-state conditions by a number of gaseous contaminants. Two groups of chemical contaminants are prescribed (the acid gas challenge group and the volatile organic compounds challenge group), and the user may select one or both groups for testing. However, all representative compounds of a group selected are tested for reporting purposes. Other challenge gases may be tested using the methodology described in this standard but are not part of the reporting requirements. The procedure is written for testing individual chemical contaminants. Testing of mixtures of chemical contaminants, although possible using this procedure, would be considered a nonstandard test and require a much higher level of understanding, expertise, control, and analysis to achieve meaningful results.

The laboratory test apparatus, equipment, test protocol, quality control guidelines, and equipment calibration specified in this standard are designed to ensure repeatability within ±10% of the measured value. Considerable capital is required to establish a laboratory with the test apparatus and instrumentation prescribed. However, compliance with the test standard cannot be met with alternative test apparatus or procedures because of the complexity of gaseous contaminant removal processes.

ASHRAE Standard 145.1 is intended for use in assessing the performance of loose granular media and is the first of two standards developed by SSPC 145. The other, designated ASHRAE Standard 145.2, Laboratory Test Method for Assessing the Performance of Gas-Phase Air-Cleaning Systems: Air-Cleaning Devices, *focuses on assessing the performance of sorptive media gas-phase air-cleaning devices.*

1. PURPOSE

The purpose of this standard is to provide a standard laboratory test method for assessing the performance of loose granular media used in gas-phase air-cleaning systems. The results of these tests can provide information to the engineer that is useful in the design and selection of air-cleaning equipment and the design of air-cleaning systems for controlling indoor concentrations of gaseous air contaminants.

2. SCOPE

2.1 This standard prescribes a small-scale laboratory test method for measuring the contaminant removal efficiency of loose granular sorptive media used in gas-phase air-cleaning equipment as installed (in a test apparatus) in an airstream and challenged with test gases under steady-state conditions. This test is conducted at elevated gas challenge concentrations (relative to ventilation applications) and therefore should be used to compare media rather than directly predict performance in any particular application.

2.2 This standard defines methods of calculating and reporting results obtained from the test data and establishes a results reporting system that can be applied to loose granular media covered by this standard.

2.3 This standard does not apply to

a. bonded carbon panels, beaded activated carbon, carbon cloths, absorbent-loaded nonwovens, dry-process carbon composites, or
b. particulate removal equipment.

3. DEFINITIONS AND ACRONYMS

3.1 Definitions. Some terms are defined here for the purposes of this standard. When definitions are not provided, refer either to *ASHRAE Terminology of Heating, Ventilation, Air Conditioning and Refrigeration*[1] or to ASTM D-2652-05A, *Standard Terminology Relating to Activated Carbon*.[2] Otherwise, common usage shall apply.

adsorbent: any solid having the ability to concentrate significant quantities of other substances on its surface.

adsorption, chemical (chemisorption): binding of a contaminant to the surface of a solid by forces with energy levels approximately those of a chemical bond. This process is usually followed by a chemical reaction that removes the con-