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Standard Test Method for Chlorofluorocarbon Activity of Activated Carbon¹

This standard is issued under the fixed designation D 5020; 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 determination of the CFC (chlorofluorocarbon) activity of new or reactivated activated carbon. CFC activity is defined as the ratio, in percent, of the weight of test adsorbate, 1,2-dichlorotetrafluoroethane (CFC-114), adsorbed after the sample of activated carbon is saturated under conditions described in this test method, to the initial weight of the sample.

1.2 Test Method D 3467 is similar to this test method, but employs carbon tetrachloride as the test adsorbate. Sosa and Underhill,² with measurements from eighteen activated carbons, found that a linear regression of the activity determined by carbon tetrachloride (as the y-axis) versus the CFC activity determined using CFC-114 (as the x-axis) can be expressed by the equation: $y = 0.985x + 0.10$ with a correlation coefficient of 0.997. Thus, although the results obtained with CFC-114 are highly predictive of the activity determined using carbon tetrachloride, these activities are not generally equivalent, and the test adsorbate used for the procedure should be stated. Jonas and Sosa and Underhill² predicted this lack of equivalence from differences in the vapor pressure, density of the liquid phases, and polarizability of the test adsorbates.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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. For a specific hazard statement, see Section 7.*

2. Referenced Documents

2.1 ASTM Standards:

- D 2652 Definitions of Terms Relating to Activated Carbon³
- D 2867 Test Method for Moisture in Activated Carbon³
- D 3467 Test Method for Carbon Tetrachloride Activity of Activated Carbon³
- D 3447 Test Method for Purity of Trichlorotrifluoroethane⁴
- E 300 Practice for Sampling Industrial Chemicals⁴

¹ This test method is under the jurisdiction of ASTM Committee D-28 on Activated Carbon and is the direct responsibility of Subcommittee D28.04 on Gas Phase Evaluation Tests.

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² Sosa, A., and Underhill, D., "Substitutes for Carbon Tetrachloride in the Standard ASTM Method for Activity of Activated Carbon," *Journal of the Air Pollution Control Association*, Vol 34, 1984, pp. 1215-1217.

³ *Annual Book of ASTM Standards*, Vol 15.01.

⁴ *Annual Book of ASTM Standards*, Vol 15.05.

3. Terminology

3.1 **Definitions**—Terms relating to this standard are defined in Definitions D 2652.

4. Summary of Test Method

4.1 CFC activity is determined by flowing the test adsorbate, CFC-114, under specified conditions, through a sample of activated carbon of known weight, until the activated carbon is saturated; then, the weight of retained adsorbate is determined. The adsorbed CFC is expressed as a weight percentage of the dried activated carbon and is termed the CFC activity.

5. Significance and Use

5.1 CFC activity measured by this test method is basically a measure of the micropore volume of the activated carbon sample. This test method is therefore a means of determining the degree of activation, and hence is a useful means of quality control for activated carbons.

6. Apparatus

- 6.1 *Balance*, capable of weighing to within ± 1 mg.
- 6.2 *Suitable Flow Control Device*.
- 6.3 *Adsorption Tube*, as shown in Fig. 1.
- 6.4 *Thermostatted Water Bath*, capable of maintaining sample tube at a temperature of $25 \pm 1^\circ\text{C}$.

7. Reagents and Materials

7.1 *CFC-114*, 95 % by weight minimum content of 1,2-dichlorotetrafluoroethane, 99.7 % by weight minimum content of 1,2-dichlorotetrafluoroethane plus 1,1-dichlorotetrafluoroethane.⁵ Test Method D 3447 may be modified to determine the purity of CFC-114.

8. Hazards

8.1 **Warning:** Operate the test equipment in a well-designed fume hood capable of exhausting any vapors released. The 1988 TLV for CFC-114 is 1000 ppm TWA (Time Weighted Average) for an eight hour exposure. Contact with liquid CFC-114 may cause frostbite. Conform conditions for stack release of CFC-114 to the regulations of the U.S. Environmental Protection Agency.

9. Sampling

9.1 See Practice E 300 for guidance in sampling activated carbon.

⁵ CFC-114 available from Scientific Gas Products, Plainfield, NJ, Scott Specialty Gases, Plumsteadville, PA, and Allied-Signal Company, have been found suitable.