Designation: D 6196 – 03

Standard Practice for Selection of Sorbents, Sampling, and Thermal Desorption Analysis Procedures for Volatile Organic Compounds in Air[1]

This standard is issued under the fixed designation D 6196; 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 practice is intended to assist in the selection of sorbents and procedures for the sampling and analysis of ambient (**1**)[2], indoor (**2**) and workplace (**3, 4**) atmospheres for a variety of common volatile organic compounds (VOCs). It may also be used for measuring emissions from materials in small or full scale environmental chambers or for human exposure assessment.

1.2 A complete listing of VOCs for which this practice has been tested, at least over part of the measurement range (1.6), is shown in Tables 1-9. For other compounds this practice shall be tested according to EN 1076 (pumped); Practice D 6246, ISO 16107, ANSI/ISEA 104, EN 838 or EN 13528-1/ EN 13528-2 (diffusive); or other appropriate validation protocols (Sections 13 and 14). (**5,1**)

1.3 This practice is based on the sorption of VOCs from air onto selected sorbents or combinations of sorbents. Sampled air is either drawn through a tube containing one or a series of sorbents (pumped sampling) or allowed to diffuse, under controlled conditions, onto the sorbent tube or tubes (diffusive or passive sampling). The sorbed VOCs are subsequently recovered by thermal desorption and analyzed by capillary gas chromatography.

1.4 This practice applies to three basic types of samplers that are compatible with thermal desorption: (*1*) pumped sorbent tubes containing one or more sorbents; (*2*) axial diffusive samplers (typically of the same physical dimensions as standard pumped sorbent tubes and containing only one sorbent); and (*3*) radial diffusive samplers.

1.5 This practice recommends a number of sorbents that can be packed in sorbent tubes, for use in the sampling of a wide range of different volatile organic compounds boiling in the range 0 to 400°C (v.p. 15 to 0.01 kPa at 25°C).

1.5.1 For pumped sampling, sorbent selection is based on breakthrough capacity. Single-bed tubes containing for example sorbent Type A[3,4] are appropriate for normal alkanes from n-C_6(hexane) to n-C_{10}(decane) and substances with similar volatility (v.p. 15 to 0.3 kPa at 25°C). More volatile materials should be sampled on stronger sorbents, such as sorbent Type B[3,5]. Other sorbent types than those specified may be used, if their breakthrough capacities are adequate and their thermal desorption blanks are sufficiently small. Examples are given in Appendix X2. A broader range of VOCs may be sampled using multi-bed tubes.

1.5.2 Guidance given for the selection of sorbents for pumped monitoring tubes can be applied equally well to axial diffusive sampling tubes. The restriction to a single sampling surface (hence single sorbent), limits the target analyte range that can be monitored by a single tube. However, the unobtrusive nature and low cost of diffusive samplers usually means that two or more samplers containing different sorbents can be used in parallel without impacting study objectives.

1.5.3 The high sampling rate and associated risk of back diffusion associated with radial diffusive samplers typically restricts the use of these samplers to compounds of equal or lower volatility than benzene. It also means that stronger sorbents are generally required for these samplers when compared with either axial diffusive or pumped sorbent tubes.

1.6 This practice can be used for the measurement of airborne vapors of these volatile organic compounds over a wide concentration range.

1.6.1 With pumped sampling, this practice can be used for the measurement of airborne vapors of VOCs in a concentration range of approximately 0.1 µg/m^3 to 1 g/m^3, for individual organic compounds in 1–10 L air samples. The method is also suitable for the measurement of the airborne concentrations of

[1] This practice is under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.05 on Indoor Air.

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[2] The bold face numbers in parentheses refer to the list of references at the end of this practice.

[3] If you are aware of alternative sorbent types, please provide this information to ASTM Headquarters. Your comments will be carefully considered at a meeting of the responsible technical committee, which you may attend.

[4] An example of sorbent Type A known to perform as specified in this practice is Chromosorb 106 manufactured by Manville Corp., USA and available from several commercial sources.

[5] An example of sorbent Type B known to perform as specified in this practice is Carboxen 569 manufactured by Supelco, Inc., USA.

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