



**Designation: D 6196 – 97**

## **Standard Practice for Selection of Sorbents and Pumped Sampling/Thermal Desorption Analysis Procedures for Volatile Organic Compounds in Air<sup>1</sup>**

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 ( $\epsilon$ ) 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 (**Ref 1**)<sup>2</sup>, indoor (2) and workplace (3) 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 (1.5), is shown in Tables 1-6. For other compounds this practice shall be tested according to EN 1076 or other appropriate validation protocols (Sections 13 and 14). (**4, 1**)

1.3 This practice is based on the sorption of VOCs from air onto selected sorbents or combinations of sorbents. Sampled air is pulled through a tube containing these sorbents. The sorbed VOCs are subsequently recovered by thermal desorption and analyzed by capillary gas chromatography.

1.4 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, in the range 0 to 400°C (v.p. 15 to 0.01 kPa at 25°C). Single-bed tubes containing for example sorbent Type A<sup>3,4</sup> are appropriate for normal alkanes from n-C<sub>6</sub>(hexane) to n-C<sub>10</sub>(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<sup>3,5</sup>. Other sorbent types than those specified may be used, if their breakthrough capacities are adequate and their thermal desorption blanks are sufficiently small. Ex-

amples are given in Appendix X2. A broader range of VOCs may be sampled using multi-bed tubes.

1.5 This practice can be used for the measurement of airborne vapors of these volatile organic compounds in a concentration range of approximately 0.1 µg/m<sup>3</sup> to 1 g/m<sup>3</sup>, for individual organic compounds in 1–10 L air samples. The method is also suitable for the measurement of the airborne concentrations of individual components of volatile organic mixtures, provided that the total loading of the mixture does not exceed the capacity of the tube. Quantitative measurements are possible when using validated procedures with appropriate quality assurance measures.

1.5.1 The upper limit of the useful range is set by the sorptive capacity of the sorbent used, and by the linear dynamic range of the gas chromatograph, column and detector, or by the sample splitting capability of the analytical instrumentation used. The sorptive capacity is measured as a breakthrough volume of air, which determines the maximum air volume that must not be exceeded when sampling.

1.5.2 The lower limit of the useful range depends on the noise level of the detector and on blank levels of analyte or interfering artifacts, or both, on the sorbent tubes.

1.5.3 Artifacts are typically <1ng for well conditioned sorbent Type C<sup>3,6</sup> and carbonaceous sorbents such as graphitized carbon, carbon molecular sieves and pure charcoals; at 1 to 5 ng levels for sorbent Type D<sup>3,7</sup> and at 5 to 50 ng levels for other porous polymers such as sorbent Type A and sorbent Type E<sup>3,8</sup>. Method sensitivity is typically limited to 0.5 µg/m<sup>3</sup> for 10 L air samples with this latter group of sorbent types because of their inherent high background.

1.6 This procedure is compatible with low flow rate personal sampling pumps and can be used for personal and fixed location sampling. It cannot be used to measure instantaneous or short-term fluctuations in concentration. Alternatives for on-site measurement include, but are not limited to gas chromatography and infrared spectrometry.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D-22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.05 on Indoor Air.

Current edition approved Nov. 10, 1997. Published January 1998.

<sup>2</sup> The bold face numbers in parentheses refer to the list of references at the end of this practice.

<sup>3</sup> 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.

<sup>4</sup> 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.

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

<sup>6</sup> An example of sorbent Type C known to perform as specified in this practice is Tenax GR manufactured by Enka Research Institute NV, NL.

<sup>7</sup> An example of sorbent Type D known to perform as specified in this practice is "Tenax TA" manufactured by Enka Research Institute NV, NL.

<sup>8</sup> An example of sorbent Type E known to perform as specified in this practice is Porapak Q manufactured by Waters Associates Inc., USA.