



Standard Practices for Sampling Atmospheres for Analysis of Gases and Vapors¹

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1. Scope

1.1 These recommended practices cover the sampling of atmospheres for analysis of gases and vapors. Two types of sampling methods are covered:

	Sections
Sampling Atmospheres Without Concentration of Gases and Vapors.....	4 to 6
Sampling Atmospheres With Concentration of Gases and Vapors.....	7 to 13

1.2 Wide variations in atmospheric content of extraneous gases and vapors preclude the possibility of specifying standard methods of sampling that are applicable in all cases. Definite principles have, however, been established as a basis for the formulation of procedures for sampling that are applicable in general and are probably applicable in most specific cases. Where modifications of these procedures are necessary, they may be made by the exercise of trained judgment for each case.

1.3 Changes that may be necessary in these procedures under specific circumstances may be made in any particular case by mutual agreement of the parties concerned.

2. General Requirements

2.1 The following general requirements are applicable to all sampling methods:

2.1.1 The samples must represent the conditions existing at the point taken.

2.1.2 The samples must be of sufficient volume and must be taken frequently enough to permit an accuracy of testing requisite for the desired objective, as affected by the methods of analysis to be employed. In some cases, however, the concentration of gases or vapors to be analyzed will be so low that it will be impracticable to take a sufficiently large atmospheric sample. In such cases, the gases or vapors to be analyzed may be concentrated in the atmosphere prior to analysis of the sample.

2.1.3 The samples must be collected, packed, shipped, and manipulated prior to analysis in a manner that safeguards against change in the particular constituents or properties to be examined.

3. Interval Between Collection and Analysis

3.1 The interval between collection and analysis is governed by the following factors:

3.1.1 Chemical changes such as chemical interactions among the components of the collected sample or photochemical decomposition,

3.1.2 Adsorption of gases from the sample onto the walls of the container, and

3.1.3 Leaks.

3.1.4 In general, make the time interval between sample collection and analysis as short as possible, protect the sample against light and heat, and exercise precautions against leaks (see Section 4).

SAMPLING ATMOSPHERES WITHOUT CONCENTRATION OF GASES AND VAPORS

4. Apparatus

4.1 An evacuated container is shown in Fig. 1. It consists of a glass bulb from which the air has been removed by a vacuum pump and the neck of which has been sealed by heating and drawing to a tip during the final stage of evacuation. The vacuum-type sample container is suitable for sampling atmospheres for analysis of gases such as carbon dioxide, oxygen, methane, carbon monoxide, hydrogen, and nitrogen. It is not suitable for sampling for the determination of very reactive gases such as hydrogen sulfide, oxides of nitrogen, or sulfur dioxide, because such gases may react with dust particles, moisture, the wax sealing compound, and to some extent even with the glass of the container, so that by the time the sample is analyzed proportions of these gases will have been altered.

4.1.1 A special evacuated container (Fig. 2) may be used for collecting samples directly in a chemical absorbent in which they will later be analyzed. The container and sampling method are similar to the conventional vacuum-type sample container previously described. The bulb differs from the conventional type in that it contains a liquid absorbent for the particular gas or vapor to be analyzed that dissolves such gas and preserves it in a form that may be determined by chemical analysis.

4.2 Containers filled by gas or liquid displacement include the gas sample tube shown in Fig. 3, and ordinary heavy-wall glass bottles (Fig. 4).

NOTE 1—Bottles such as are used by druggists for magnesium citrate solutions are suitable for this purpose.

4.2.1 The gas sample tube (Fig. 3) may be metal or glass and may be closed with stopcocks or screw clamps and rubber tubing. Pinch clamps are not satisfactory, as they may not have enough tension to squeeze the rubber tubing completely closed. Metal containers should be constructed of inert metal. Iron or tinned-iron sample containers are not recommended because their rusting consumes too much oxygen. Metal containers are not suitable for sampling of many substances,

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