Australian Standard®

Methods for sampling and analysis of ambient air

Method 2.1: Preparation of reference test atmospheres—Permeation tube method

PREFACE

This Standard was prepared by the Standards Australia Committee for the Examination of Air to supersede AS 2522—1982, *Ambient air—Preparation of reference test atmospheres containing sulphur dioxide, using permeation tubes.*

During the preparation of this Standard, the committee paid special attention to ISO 6349, *Gas analysis—Preparation of calibration gas mixtures—Permeation method,* and the work of the Environmental Protection Agency, USA.

This Standard was derived from the United States Environmental Protection Agency Air Regulation Standard, Pollution Control Guide, Sub-chapter C—*Air Programs—Part 50 National primary and secondary air quality standards, Section 8031, Appendix A.*

METHOD

1 SCOPE. This Standard sets out a method for the preparation of reference test atmospheres for the determination of gaseous pollutants in ambient air, using permeation tubes. The procedure applies to the preparation of reference test atmospheres containing pollutant levels from 0.01 p.p.m. to 5.0 p.p.m. by volume (25 $\mu g/m^3$ to 14 000 $\mu g/m^3$). A list of references is provided for information on various aspects of the permeation tube procedure for preparing reference test atmospheres.

2 PRINCIPLE. The principle of the procedure relies on the diffusion of the gaseous component (e.g. NH_3, SO_2, NO_2) through a membrane in a controlled flow of carrier gas which constitutes the complementary gas of the mixture obtained. The diffusion rate of the substance through the membrane depends upon the substance itself, the nature, constitution and area of the membrane, and the temperature and difference in partial pressure of the gas between the inside and the outside of the tube. These factors can be kept constant by proper operation of the tube.

The concentration of the reference test atmosphere prepared is a function of the diffusion rate of the tube and the flow rate of the complementary gas.

3 APPARATUS. The following apparatus is required:

3.1 Permeation tubes—tubes, containing a known concentration of analyte, which permit gaseous diffusion of the analyte at a known, low, constant rate.

NOTES:

1. Permeation tubes with certified permeation rates are available from the National Bureau of Standards, USA, and may be used as absolute Standards. Other permeation tubes should be calibrated for use at a given temperature.
2. Detailed directions for the calibration of permeation tubes are described in Reference 1.

3.2 Analytical balance—capable of weighing to an accuracy of ± 10 µg.