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Australian Standard®

WORKPLACE ATMOSPHERES—ORGANIC VAPOURS—SAMPLING BY SOLID ADSORPTION TECHNIQUES

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Aluminium Development Council

Australian Chemical Industry Council

Australian Institute of Occupational Hygienists

Australian Institute of Petroleum Ltd

Australian Mining Industry Council

Bureau of Steel Manufacturers of Australia

Clean Air Society of Australia and New Zealand

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Department of Occupational Health Safety and Welfare, W.A.

Government Chemical Laboratory, Qld.

Metal Trades Industry Association of Australia

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PREFACE

This Standard was prepared by the Association's Committee on Workplace Atmospheres under the direction of the Chemical Standards Board.

Acknowledgement is made of the following publications which were used in the drafting of this Standard:

United Kingdom Health & Safety Executive: Occupational Medicine and Hygiene Laboratory, *MDHS 36—Methods for the Determination of Hazardous Substances, 'Toluene in air'* (April 1984).

Linch, A.L. *Evaluation of Ambient Air Quality by Personal Monitoring* (2nd Ed) Vol 1, Gases and Vapours, CRC Press, Florida (1981).

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STANDARDS ASSOCIATION OF AUSTRALIA

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1 SCOPE. This Standard describes two methods for the sampling of organic vapours in workplace atmospheres using solid adsorption techniques. The methods are

—active sampling using pump and tube;

—passive sampling using solid adsorbent diffusive samplers.

2 APPLICATION. This Standard is applicable to the use of personal sampling pumps and adsorbent tubes or passive samplers used in the assessment of personal exposure to organic vapours present in the breathing zone. Although the methods described are intended for personal sampling, static or fixed sampling methods can be used to assist in identifying likely areas of exposure.

3 REFERENCED DOCUMENTS. The following Standards are referred to in this Standard:

AS 2380.7 Electrical Equipment for Explosive Atmospheres—Explosion-protection Techniques.
Part 7: Intrinsic Safety i.

AS 2430 Classification of Hazardous Areas.
Part 1: Explosive Gas Atmospheres.

4 DEFINITIONS. For the purpose of this Standard the following definitions apply.

4.1 Active sampler—a sampler which uses an air moving device to draw a known volume of air through a sample collecting device.

4.2 Adsorbents—specially chosen porous solids suitable for selective retention of certain gases and vapours on their surface. In physical adsorption any reaction between the adsorbent and the adsorbed gas or vapour is reversible allowing the adsorbed gas or vapour to be removed subsequently from the solid by heat, vacuum or chemical desorption. Examples of solid adsorbents include activated charcoal, silica gel, artificial zeolites and porous polymers.

4.3 Breakthrough volume (of a sampling tube)—the sample volume at which the effluent concentration from the sampling tube is 5 percent of the test concentration (see Appendix D).

4.4 Breathing zone—a hemisphere of 300 mm radius extending in front of the face and measured from the mid-point of a straight line joining the ears.

4.5 Passive sampler (diffusion sampler)—a device which samples the atmosphere by molecular diffusion, with analyte being adsorbed by an adsorbent medium within the sampler.

NOTE: The total mass of analyte collected is proportional to both the average analyte concentration in the air and the time for which the sampler is exposed.

4.6 Personal sampling—a procedure whereby air is sampled within the worker's breathing zone to evaluate personal exposure to airborne contaminants.

4.7 Sampling capacity—the capacity of a passive sampler for a specific analyte. It is a function of molecular structure and also depends on vapour pressure, environmental conditions and contaminant concentration.

NOTE: Sampling capacity values for various types of passive samplers are usually supplied by manufacturers.

4.8 Static sampling—a procedure whereby fixed samplers are strategically located within a workplace.

NOTE: This method of sampling is preferred when evaluating engineering controls or determining sources of contamination.

5 CHOICE OF SAMPLER. The following considerations and those listed in Appendix B shall be taken into account when selecting sampling devices:

(a) *Choice of adsorbent and design of the sampling device.* These are primarily determined by the properties of the analyte being collected and the purpose for which the monitoring is intended. Information on choice of adsorbent should be obtained from commercial sources where available, or from methods such as those available from National Institute for Occupational Safety and Health (USA) or Health and Safety Commission (UK).

(b) *Static samplers* (e.g. passive samplers when used under static conditions). Care should be exercised in the selection of static samplers as they are ideally used where air movement suits both the sampling characteristics of the sampler and the principles of diffusion sampling.

(c) *Rate and duration of sampling.* These parameters are determined by the nature of the analyte, the sampling requirements (e.g. short or long term) and expected analyte concentration. Both parameters should be optimized to achieve the desired sensitivity without overloading the sample collection device.

(d) *The upper limit of the useful range.* This is determined by the adsorptive capacity of the adsorbent medium.

(e) *The lower limit of the useful range.* This is determined by factors such as levels of analyte on the adsorbent, background adsorption efficiency, sample volume, desorption efficiency and analytical limitations.

(f) *Collection efficiency.* This is reduced with increasing temperature and humidity.

(g) *Effects of sample storage.* Specific analytes on certain adsorbents may not be stable under some sampling and storage conditions. This can result in the loss of the primary analyte or the formation of secondary compounds through degradation or hydrolysis.