

ICS 13.100  
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**NATIONAL OCCUPATIONAL HEALTH STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GBZ/T 300.96-2018**

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**Determination of toxic substances in workplace air -- Part 96:  
Sevoflurane, isoflurane and enflurane**

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**(English Translation)**

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### Foreword

This part is the 96th part of GBZ/T 300 "Measurement of Toxic Substances in Workplace Air".

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This section is mainly drafted by. Shenzhen City Occupational Disease Prevention and Control Institute, Guangdong Provincial Occupational Disease Prevention and Treatment Institute, Luohu District, Shenzhen City, Guangdong Province Disease Prevention and Control Center, Yantian District Center for Disease Control and Prevention, Shenzhen, Guangdong Province.

### 1 Scope

This part of GBZ/T 300 specifies solvent desorption-gas chromatography for the determination of sevoflurane, isoflurane and enflurane in the air of the workplace.

This section applies to the detection of the concentration of vaporous sevoflurane, isoflurane and enflurane in the workplace air.

## 2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document.

For undated references, the latest edition (including all amendments) applies to this document.

GBZ 159 Sampling specification for monitoring of hazardous substances in the workplace air  
GBZ/T 210.4 Guide to the development of occupational health standards - Part 4.  
Methods for the determination of chemical substances in the workplace air

## 3 Basic information on sevoflurane, isoflurane and enflurane

The basic information for sevoflurane, isoflurane and enflurane is shown in Table 1.

Table 1 Basic information on sevoflurane, isoflurane and enflurane

Chemical material

Chemical Abstracts

(CAS number)

Molecular formula

Relative molecule

Occupation exposure limit Mg/m Sevoflurane (sevoflurane, Sevoflurane) 28523-86-6  
C<sub>4</sub>H<sub>3</sub>F<sub>7</sub>O.200.05 -Isoflurane (1-chloro-2,2,2-trifluoroethyl difluoromethyl ether, Isoflurane)  
26675-46-7 C<sub>3</sub>H<sub>2</sub>ClF<sub>5</sub>O 184.5 -Enflurane (2-chloro-1,1,2-trifluoroethyl difluoromethyl ether,  
Enflurane) 13838-16-9 C<sub>3</sub>H<sub>2</sub>ClF<sub>5</sub>O 184.5 -

### 4.1 Principle

The vaporous sevoflurane, isoflurane and enflurane in the air are collected by activated carbon tube, desorbed by dichloromethane, and injected through gas chromatography column.

The hydrogen flame ionization detector detects and quantifies the retention time, and the peak area or peak height is quantified.

### 4.2 Instrument

#### 4.2.1

Activated carbon tube, solvent desorption type, containing 100mg/50mg activated carbon.

#### 4.2.2

Air sampler, flow rate from 0mL/min to 500mL/min.

#### 4.2.3

Solvent desorption bottle, 2mL.

#### 4.2.4

Microinjector, 10  $\mu$ L, 100  $\mu$ L.

#### 4.2.5

Gas chromatograph with hydrogen flame ionization detector, instrument operation reference conditions.

- a) Column. 30m x 0.32mm x 1.0 $\mu$ m, 100% dimethylsiloxane;
- b) column temperature. initial temperature 40 ° C, kept for 3 min, heated to 180 ° C at 60 ° C/min;
- c) gasification chamber temperature. 250 ° C;
- d) detection chamber temperature. 300 ° C;
- e) carrier gas (nitrogen) flow rate. 2.0mL/min;
- f) Split ratio. 20.1.

### 4.3 Reagents

#### 4.3.1

Dichloromethane, chromatographic identification of interference-free peaks.

#### 4.3.2

sevoflurane, the mass of 1 L liquid at 1.5 ° C is 1.524 mg.

#### 4.3.3

Isoflurane, the mass of 1L liquid is 1.502mg at 20 °C.

#### 4.3.4

Enflurane, at 20 ° C, the mass of 1 L liquid is 1.526 mg.

#### 4.3.5

Standard solution. Add methylene chloride to the volumetric flask. After weighing accurately, add a certain amount of sevoflurane, isoflurane and/or enfluride.

The alkane was weighed accurately and made up to volume with dichloromethane. The concentration of the solution was calculated from the difference in weighing and was a standard solution of sevoflurane, isoflurane and enflurane.

Or formulated with a nationally recognized standard solution.

#### **4.4 Sample collection, transportation and storage**

##### **4.4.1**

On-site sampling shall be performed in accordance with GBZ 159.

##### **4.4.2**

Short-time sampling. At the sampling point, a 15 min air sample was collected with an activated carbon tube at a flow rate of 300 mL/min.

##### **4.4.3**

Long-term sampling. At the sampling point, an air sample of 2h to 8h is collected with an activated carbon tube at a flow rate of 50 mL/min.

##### **4.4.4**

Immediately after sampling, the ends of the activated carbon tube are closed and transported and stored in a clean container. The sample can be stored for 10 days at room temperature.

##### **4.4.5**

Sample blank. At the sampling point, open both ends of the activated carbon tube and immediately close it, then transport, store and measure with the sample.

Not less than 2 sample blanks per batch.

#### **4.5 Analysis steps**

##### **4.5.1**

Sample treatment. Put the activated carbon in the front and back sections into two solvent desorption bottles, add 1.0mL of dichloromethane each, and block the solution.

Soak for 30min, shake it from time to time, and sample solution for measurement.

##### **4.5.2**

Preparation of standard curve. Take 4 to 7 volumetric flasks and dilute the standard solution with dichloromethane to 0.0g/mL~300.0g/mL.

The standard range of sevoflurane, isoflurane and enflurane. Adjust the gas chromatograph to the best measurement state according to the operating conditions of the instrument.

Inject 1.0 L and measure the peak height or peak area of each concentration of the standard series. Measured peak height or peak area versus corresponding sevoflurane, isoflurane the alkane and enflurane concentrations (g/mL) are plotted against a standard curve or a regression equation, and the correlation coefficient should be  $\geq 0.999$ .