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GB/T 14675-93

Air quality - Determination of odor - Triangle odor bag method

空气质量 恶臭的测定 三点比较式臭袋法

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1 Subject content and scope of application

1.1 This Standard specifies the determination method for the odor concentration of odor source exhaust and ambient air samples by human olfactory organ.

1.2 This Standard applies to the determination of the odor concentration of gas samples emitted in different forms from all kinds of odor sources and ambient air samples. The samples include samples containing only one odor substance and complex odor samples containing two or more odor substances.

1.3 The determination method in this Standard is not restricted by species, number of species, concentration range and proportion of ingredients contained of odor substances.

2 Terms

2.1 Odor concentration

Odor concentration is the indicator of quantified size of odor determined by olfactory organ test method. The dilution factor, applied when the odor sample is diluted with odorless clean air to panel's threshold value, is called odor concentration.

2.2 Odor threshold value

Odor threshold value includes the sensory threshold value that can be used to sniff the presence of odor and the identification threshold value that can determine the odor characteristics. What used in this Standard is sensory threshold value.

2.3 Panel

Those who are qualified after being selected through special exam and trained, taken as the panel required for the determination by the method in this Standard.

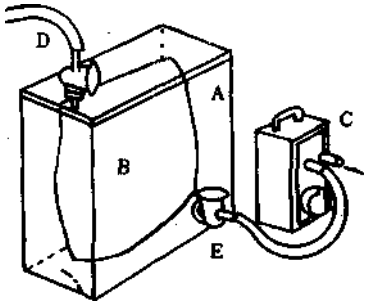

Figure 3 -- Exhaust sampling apparatus

A - vacuum box; B - sampling bag; C - gas pump; D - sample gas conduit; E - valve

4.7 Sniffing room:

4.7.1 The sniffing room shall be away from the place where emits odor. The indoor shall be able to be ventilated and the temperature is kept at 17 ~ 25 °C. It shall be able to contain at least 6 ~ 7 panel members at the same time.

4.7.2 It shall set up a separate gas preparation room.

4.8 Syringes: 100 mL, 50 mL, 10 mL, 5 mL, l mL and 100 μL.

5 Panel

5.1 Panel

The panel member shall be 18 ~ 45-year-old male or female, no smoking and without olfactory organ disease, passing the olfactory detection. If no special circumstances, they can undertake panel work for three consecutive years.

5.2 Olfactory detection and panel selection

The olfactory detection must be carried out in the sniffing room. The examiner immerses one end of the three pieces of odorless paper among five pieces of odorless paper into 1 cm of the odorless liquid, and immerses the other two pieces of odorless paper into 1 cm of one kind of standard odor liquid, and then places the five pieces of paper in parallel at a distance from each other. If the people under examination can correctly identify the paper with odor liquid, exam them using another four kinds of standard odor liquids according to the above method. People who can identify the paper with five kinds of odor liquids can be the member of the panel.

6 Samples

6.1 Collection of odor samples in exhaust cylinder

For odor emitted from the exhaust pipe (cylinder), the odor sample is collected according to the sampling method of Figure 3. When the temperature of exhaust is high, the sampling conduit shall be water cooled or air cooled so that the temperature of the gas entering the sampling bag is close to normal temperature. When sampling, it shall determine the timing of sampling and inflation rate according to the survey results of exhaust conditions, to ensure that the collected gas samples are representative. Before sampling, fill the sampling bag three times with the determined gas.

6.2 Sampling of environmental odor

6.2.1 Vacuum treatment of sampling bottle

In the laboratory, the bottle is evacuated to a pressure of minus 1.0×10^5 Pa in the bottle with vacuum exhaust treatment system.

6.2.2 Sampling and sample storage

When sampling, open the sampling bottle's stopper, and plug the stopper after the sample gas is filled into the sampling bottle until the pressure is the atmospheric pressure. The sampling bottle is transported to the laboratory while being protected from the light, and it shall be determined in 24 hours.

7 Determination of samples

7.1 Dilution and determination of emission source odor samples

For high-concentration odor samples of organized and unorganized emissions collected in sampling bags and sampling bottles, dilute and determine as follows.

7.1.1 After the sampling bottles for collecting gas samples are transported to the laboratory, remove the large stopper on the bottle and quickly insert a 10-L polyester liner bag having the stopper with a ventilation pipe into the bottle. Use a syringe to extract the gas in the sampling bottle at the small stopper to prepare gas bags for sniffing, fill the indoor air through the ventilation pipe of the large stopper into the liner bag, and the pressure inside the sampling bottle shall maintain the same.

7.1.2 The panel composed of six members is ready for sniffing in the odorless room. The panel shall not carry and use spices and cosmetics with odor, and shall not eat foods with pungent odor. The panel member suffering from a cold or discomfort of olfactory organ shall not participate in the determination of the day.

7.1.3 The dilution gradient of high-concentration odor samples is shown in Table 2.

$$M = \frac{1.00 \times a + 0.33 \times b + 0 \times c}{n} \quad \cdots\cdots (1)$$

where: M - the average correct answer rate of the panel;

a - the number of correct answers;

b - the number of unknown answers;

c - the number of incorrect answers;

n - the total number of answers (18 times).

1.00, 0.33, 0 - the statistical weight coefficient.

7.2.6 Correct answer rate analysis and M value comparison test

7.2.6.1 When the M value is greater than 0.58, the dilution factor of the odor sample is continued to be increased with a 10-fold gradient, and repeat the test and calculation of 7.2.3, 7.2.4 and 7.2.5 until M_1 and M_2 are obtained.

7.2.6.2 M_1 is the value when the average correct answer rate of a certain dilution factor is less than 1 and greater than 0.58. M_2 is the value when the average correct answer rate of a certain dilution factor is less than 0.58.

7.2.6.3 When the average correct answer rate of the first-level 10-fold dilution sample is less than (or equal to) 0.58, the sample is not diluted and sniffed anymore, and the sample odor concentration is expressed as “< 10” or “= 10”.

8 Result calculation

8.1 Calculation of determination result of pollution source odor

8.1.1 Summarize the result of each panel member to the answer record form; the correct answer for each member each time is expressed as “0”, and the incorrect answer is expressed as “×”. The answer record form is shown in 8.3.

8.1.2 Calculate the individual odor threshold value X_i:

$$X_i = \frac{\lg a_1 + \lg a_2}{2} \quad \cdots\cdots (2)$$

where: a_1 - the maximum dilution factor of individual correct answer;

a_2 - the dilution factor of individual incorrect answer

8.1.3 After discarding the maximum and minimum values of the individual odor threshold value in the panel, calculate the arithmetic mean threshold value (X) of the panel.

8.1.4 Calculation of sample odor concentration (y):

$$y = 10^X \qquad \cdots\cdots (3)$$

where: y - the sample odor concentration;

X - the arithmetic mean threshold value of the panel.

8.2 Calculation of determination result of environmental odor

Calculate the odor concentration of the environmental odor sample according to the M_1 and M_2 values obtained in the 7.2.6 test.

$$Y = t^1 \times 10^{\alpha \cdot \beta} \qquad \cdots\cdots (4)$$

$$\alpha = \frac{M_1 - 0.58}{M_1 - M_2}; \beta = \lg \frac{t_2}{t_1}$$

where: Y - the odor concentration;

t_1 - the dilution factor when the average correct answer rate of the panel is M_1;

t_2 - the dilution factor when the average correct answer rate of the panel is M_2.

8.3 Calculation example

8.3.1 An example of record form and calculation of determination results of pollution source odor is as follows:

(the odor index is 10 times the logarithm of odor concentration), the repeatability standard deviation is 2.4, and the repeatability relative standard deviation is 5.6 %; the reproducibility standard deviation is 2.7, and the reproducibility relative standard deviation is 6.3 %

The confidence interval of the recovery rate of this method is 105 ± 9.3 %; the average odor threshold value is 3.4×10^{-4} mg/m^3.

10 Precautions

10.1 The standard odor samples used in the test shall be kept in good condition to prevent odor pollution caused by leakage. The gas in the sample bags after sniffing shall not be exhausted in the sniffing room.

10.2 It shall have technical training to make the panel understand the odor characteristics of typical odor substances and improve the ability to distinguish various odors.

10.3 Odorless clean gases required for dilution of odor samples are provided by the air purification apparatus of clause 4.3 of this Standard. The ventilation rate, filling amount of activated carbon, use and replacement cycle of activated carbon, etc. related to the air purification effect are determined by the detection result of the panel on whether the purifying gas has odor. The inner diameter of the air bag's air supply pipe connected to the air supply inlet shall be slightly larger than the outer diameter of the air purification apparatus's air supply pipe, that is, to ensure that the air bag is filled with a specified volume of clean air, and to prevent air bag rupture caused by excessive inflation and overpressure.

10.4 It may also use oil-free air pump to supply air to the air purification apparatus, and it is strictly prohibited to use oil-bearing or odor-emitting air supply equipment.

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