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Translated by: www.ChineseStandard.net
Wayne Zheng et al.
Email: Sales@ChineseStandard.net

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National Standard

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Air quality - Determination of formaldehyde - Acetylacetone spectrophotometric method

空气质量-甲醛的测定-乙酰丙酮分光光度法

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Air quality - Determination of formaldehyde – Acetylacetone spectrophotometric method

1 Subject content and application scope

1.1 Subject content

This Standard specifies the acetylacetone spectrophotometric method to measure formaldehyde in industrial emissions and ambient air.

1.2 Application scope

1.2.1 This Standard applies to emissions in those industries such as resin manufacturing, coatings, rayon, plastics, rubber, dye, pharmaceutical, plaint, and tanning. And it also applies to determination of formaldehyde vapor produced when conducting pharmaceutical disinfection, corrosion, and fumigation.

1.2.2 When the sampling volume is 0.5~10.0 L, the measuring range is 0.5~800 mg/m^3.

1.2.3 When formaldehyde concentration is 20 μg/10 ml, coexist 8g of phenol (400 times), 10mg of acetaldehyde (500 times), 600mg of ammonium ion (30000 times) without interference; coexist SO_2, less than 20 μg, NO_2 is less than 50 μg, the recovery of formaldehyde shall not be less than 95%.

2 Principle

After formaldehyde gas is absorbed by water, then in the acetic acid-ammonium acetate buffer solution of PH=6, it has chemical action with acetylacetone. Under the condition of boiling water bath, it quickly generates stable yellow compound. Measure it at wavelength of 413 nm. The response equation is as follows:

than 99%.

4.4 Colorimetric tube with stopper: With 10ml and 25ml scale, calibrated.

4.5 Spectrophotometer: Attached with 1cm absorption cell.

4.6 Standard Pitot tube: With correction factor.

4.7 Inclined micro-manometer.

4.8 Sampling lead pipe: Teflon tube. Inner diameter is 6~7mm, with glass fiber filter in front of the lead pipe.

4.9 Aneroid barometer.

4.10 Mercury thermometers: 0~100°C.

4.11 pH acidity.

4.12 Water bath.

5 Samples

5.1 Sample collection

Sampling system is in-series consisted of sampling lead pipe (4.8), sampling absorption tube (4.3), and air sampler (4.1). The volume of absorption tube is 50ml or 125ml. The volume of absorbing liquid (3.2) is 20ml or 50ml respectively. At flow rate of 0.5~1.0L/min, sample the air for 5~20min.

5.2 Sample storage

Collected sample shall be stored up at 2~5°C. Complete the analysis in 2 days, so as to prevent formaldehyde from oxidation.

5.3 Calibration of sample volume

5.3.1 Flow calibration

When sampling, the air sampler (4.1) shall be calibrated with soap film flowmeter (4.2).

Calculate the sampling volume V_m(L) according to formula (3).

$$V_m = Q_r' \times n \quad \text{.....(3)}$$

In the formula: Q_r' - Flow after calibrating, L/min;

A_b - Absorbance of blank test (6.3).

Calculate the formaldehyde content x in the test sample with formula (7).

$$x = \frac{y-a}{b} \times \frac{V_1}{V_2} \quad or \quad x = (y-a)B_a \times \frac{V_1}{V_2} \qquad (7)$$

In the formula: V_1 - Volume of constant volume, ml;

V_2 - Test sampling volume, ml.

Calculate the formaldehyde concentration c (mg/m^3) in exhaust gas or ambient air with formula (8).

$$c = \frac{x}{V_{nd}} \qquad (8)$$

In the formula: V_{nd} - Standard state volume of sampled gas, (0°C, 101.325kPa) L.

7.2 Precision and accuracy

Analyzed by 6 laboratories, the 2 samples containing 2.96mg/L and 3.55mg/L of formaldehyde are consistent. The repeatability standard deviations are 0.035mg/L and 0.028mg/L. The repeatability relative standard deviations are 1.2% and 0.79%. The reproducibility standard deviations are 0.068mg/L and 0.13mg/L. The reproducibility relative standard deviations are 2.3% and 3.6%. Spiked recovery is 100.3%~100.8%. The spiked recoveries in 4 sample analysis are 95.3%~104.2%.

8 Precautions

Formaldehyde will be oxidized under the sunshine. Therefore, when sampling, it shall use brown absorption tube. In the transport and storage process of sample, it shall adopt the measures to avoid light.

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Additional Note:

This Standard was proposed by Standard Planning Office of National Environmental Protection Authority.

This Standard was drafted by Shanghai Environmental Monitoring Center.

The main drafters of this Standard: Ding Li, and Guo Qiuyun.

This standard shall be interpreted by National Environmental Monitoring Station.

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