

HJ

INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Ambient air-Automatic determination of ozone-Chemiluminescence method

环境空气 臭氧的自动测定 化学发光法

(English Translation)

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1 Scope of application

This standard specifies a chemiluminescence method for the automatic determination of ozone in ambient air.

This standard applies to the automatic determination of ozone in ambient air.

When the instrument range is 0 nmol/mol ~ 500 nmol/mol, the detection of this method under the reference state (298.15 K, 101.325 kPa) the limit is 4 µg/m³, and the lower limit of determination is 16 µg/m³.

2 Normative references

This standard refers to the following documents or clauses thereof. For dated references, only the dated version applies to this standard.

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

HJ 193 Technical specification for installation and acceptance of continuous automatic monitoring system for ambient air gaseous pollutants (SO₂, NO₂, O₃, CO) HJ 654 Technical requirements and detection methods of continuous automatic monitoring system for ambient air gaseous pollutants (SO₂, NO₂, O₃, CO) HJ 818 Ambient air gaseous

pollutants (SO₂, NO₂, O₃, CO) continuous automatic monitoring system operation and quality control technical specifications

3 Terms and Definitions

The following terms and definitions apply to this standard.

ozone transfer standard According to relevant operating procedures, it can be accurately reproduced or accurately analyzed, and can be traced to a higher level or higher authoritative standard ozone concentration of transportable equipment. Ozone transfer standards are used to transfer the amount of ozone primary standards or to calibrate ozone analyzers at monitoring sites.

Note: The ozone transfer standard is divided into the generation type ozone transfer standard and the analytical ozone transfer standard according to the working principle. According to the position in the step-by-step transmission of ozone value the position is divided into two-level transfer standard, three-level transfer standard and four-level transfer standard.

productive ozone transfer standard this type of transfer standard only contains an ozone generator and does not contain a UV photometer. The odor that occurs is adjusted by adjusting the power of the generator.

The oxygen concentration cannot be measured in real time for the generated ozone concentration. The Generative Ozone Transfer Standard applies only to the quality of on-site ozone analyzers.

Quantitative control work, not suitable for calibrating analytical ozone transfer standards.

analytical ozone transfer standard this type of delivery standard contains a UV photometer that measures the ozone concentration generated by the ozone generator in real time. Analytical ozone delivery standards can be Used to calibrate analytical ozone transfer standards, generative ozone transfer standards and field ozone analyzers. Some analytical ozone delivery standards come with the ozone generator can measure the ozone concentration while generating ozone, and perform real-time feedback adjustment to the ozone generator.

4 Principles of the method

The sample air enters the instrument reaction chamber through the particulate filter at a constant flow, and the ozone is mixed with the excess nitric oxide for an instant reaction After luminescence, the ozone concentration in the sample air is proportional to the luminescence intensity within a certain concentration range.

5 Interference and cancellation

Particulate matter in the air may accumulate in the sampling line or reaction chamber and interfere with the measurement of ozone.

Install a particulate filter to eliminate the effects of particulate matter.

6.1 Nitric oxide. $x=10000 \mu\text{mol/mol}$

The error is within $\pm 10\%$. It is prepared with nitrogen with a purity of not less than 99.999% and stored in a steel cylinder.

6.2 Filter membrane. The material is polytetrafluoroethylene, and the pore size is less than or equal to $5 \mu\text{m}$.

6.3 Zero gas. It is generated by zero gas generator, and can also be provided by zero gas cylinder. The performance index should meet the relevant requirements of HJ 654. If using Synthetic air, in which the concentration of oxygen shall be $20.9\% \pm 2.0\%$ of the synthetic air.

6.4 Nitrogen. purity $\geq 99.999\%$.

7.1 Sampling line

It should be made of polytetrafluoroethylene, borosilicate glass and other materials that do not chemically react with ozone.

7.2 Particulate filter

Installed between the sampling manifold and the instrument inlet. The material of the filter membrane of the particulate filter should meet the requirements of 6.2, except for the filter membrane Parts should be made of polytetrafluoroethylene, borosilicate glass and other materials that do not chemically react with ozone. If the instrument has a built-in particulate filter, then no external particulate filter is required.

7.3 Ozone Analyzer

The performance index should meet the requirements of HJ 654. The ozone measurement system is shown in Figure 1.

7.4 Ozone Delivery Criteria

Analytical ozone transfer standards with ozone generators are generally used, and generative ozone transfer standards can also be used.

Measuring range. $0 \text{ nmol/mol} \sim 500 \text{ nmol/mol}$, the minimum display unit is 1 nmol/mol , the performance index of the instrument should conform to HJ 654 phase off requirements.

The ozone flow rate output by the ozone transfer standard should be at least 1 L/min greater than the instrument set flow rate of the ozone analyzer being calibrated.

8.1 Installation and debugging of the instrument

After the newly purchased ozone analyzer (7.3) is installed, various parameters should be set according to the operation manual for debugging. Debug indicators include zero points Noise, detection limit, span noise, indication error, span precision, 24 h zero drift and 24 h span drift, debugging according to HJ 193 implement.

8.2 Inspection

During the operation of the ozone analyzer (7.3), perform zero check, span check, linearity check and flow check according to HJ 818, if the inspection result is unqualified, the instrument should be calibrated and repaired if necessary. After the repair is completed, the instrument should be checked for linearity, and recalibrate.

8.3.1 Determining the Instrument Range

The range of the ozone analyzer (7.3) should be determined according to the actual concentration of ozone in different seasons. When the ozone concentration is lower than 20% of the range, a lower range should be selected.

8.3.2 Calibration procedure

8.3.2.1

Pass the zero gas into the ozone analyzer (7.3), and after the reading is stable, adjust the output value of the ozone analyzer (7.3) to be equal to zero.

8.3.2.2

Connect the ozone transfer standard (7.4) outlet to the ozone analyzer (7.3) inlet so that the ozone transfer standard (7.4) occurs the ozone concentration is 80% of the operating range of the ozone analyzer (7.3). After the reading is stable, adjust the output value of the ozone analyzer (7.3). like Use the generation type ozone transfer standard to make the output value of the ozone analyzer (7.3) equal to the ozone concentration generated by the ozone transfer standard (7.4);

If using an analytical ozone transfer standard, make the output of the ozone analyzer (7.3) equal to the actual ozone measured by the ozone transfer standard (7.4) concentration.

8.4 Determination of samples

Pass the sample air into the ozone analyzer (7.3), which automatically determines and records the ozone concentration.