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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

HJ 1043-2019

**Ambient air - Automatic determination of nitrogen oxides -
Chemiluminescence method**

环境空气 氮氧化物的自动测定 化学发光法

(English Translation)

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Table of Contents

Foreword
1 Scope
2 Normative references
3 Methodology
4 Interference and cancellation
5 Reagents and materials
6 Instruments and equipment
7 Analysis steps
8 Results calculation and representation
9 Precision and accuracy
10 Quality Assurance and Quality Control
11 Notes

Foreword

In order to implement the "Environmental Protection Law of the People's Republic of China" Environment, protect human health, standardize automatic determination methods of nitrogen oxides in ambient air, and formulate this standard.

This standard specifies the chemiluminescence method for automatic determination of nitrogen oxides in ambient air.

This standard is issued for the first time.

This standard is formulated by the Department of Eco-Environmental Monitoring, Laws and Standards Department of the Ministry of Ecology and Environment.

This standard was drafted. Dalian Ecological Environment Monitoring Center, Liaoning Province.

Verification units of this standard. Harbin Environmental Monitoring Center Station, Hangzhou Environmental Monitoring Center Station, Anshan Ecology, Liaoning Province Environmental Monitoring Center, Guangzhou Environmental Monitoring Center Station, Shenyang Ecological Environment Monitoring Center in Liaoning Province and Qingdao Ecological Environment Center in Shandong Province Environmental Monitoring Center.

This standard was approved by the Ministry of Ecology and Environment on October 24, 2019.

This standard will be implemented from April 24, 2020.

This standard is explained by the Ministry of Ecology and Environment.

Chemiluminescence method for automatic determination of nitrogen oxides in ambient air
Warning. Nitric oxide is a toxic gas. Prevent leakage during operation, and perform protective work as required.

1 Scope

This standard specifies the chemiluminescence method for automatic determination of nitrogen oxides in ambient air.

This standard applies to the automatic determination of nitric oxide, nitrogen dioxide and nitrogen oxides in ambient air.

When the measuring range of the instrument is (0 ~ 500) nmol/mol, the nitrogen oxide, nitrogen dioxide and the NO_x detection limits are 1 µg/m³, 3 µg/m³, and 2 µg/m³, and the lower detection limits are 4 µg/m³, 12 µg/m³, and 8 µg/m³; Under standard conditions, the detection limits of nitrogen oxide, nitrogen dioxide and nitrogen oxide are 2 µg/m³, 3 µg/m³ and 2 µg/m³. The lower detection limits are 8 µg/m³, 12 µg/m³ and 8 µg/m³, respectively.

2 Normative references

This standard refers to the following documents or clauses therein. For undated references, the valid version applies to this standard.

HJ 193 Ambient air gaseous pollutants (SO₂, NO₂, O₃, CO) continuous automatic monitoring system installation and acceptance technology specification
HJ 654 Ambient air gaseous pollutants (SO₂, NO₂, O₃, CO) continuous automatic monitoring system technical requirements and inspection Test method
HJ 663 Technical Specification for Ambient Air Quality Evaluation (Trial)
HJ 818 Ambient air gaseous pollutants (SO₂, NO₂, O₃, CO) continuous automatic monitoring system operation and quality control technology Technical specifications

3 Method principle

The sample air is divided into two channels, one of which directly enters the reaction chamber to measure nitric oxide; the other channel converts Nitrogen was converted into nitric oxide and entered the reaction chamber to measure nitrogen oxides. Nitric oxide in the reaction chamber is oxidized by excess ozone the excited state of nitrogen dioxide molecules emit light during the return to the ground state, and the concentration of nitric oxide in the sample air within a certain concentration range the intensity is directly proportional to the light intensity. The concentration of nitrogen dioxide is calculated from the difference between the concentration of nitrogen oxides and nitric oxide.

4 Interference and cancellation

In the process of determination, in addition to the conversion of nitrogen dioxide to nitric oxide, the molybdenum catalytic converter also contains gaseous compounds such as ammonia.

Nitrogen compounds are partially or completely converted to nitric oxide, which positively interferes with the measurement results.

5 Reagents and materials

5.1

Zero gas. Zero gas is generated by a zero gas generating device, and can also be provided by a zero gas cylinder. The performance index of zero gas should meet HJ 654 Requirements. If synthetic air is used, the oxygen concentration shall be $(20.9 \pm 2.0)\%$ of the synthetic air.

5.2

Standard gas. Certified reference material for nitric oxide, the unit is $\mu\text{mol/mol}$.

5.3

Filter membrane. The material is polytetrafluoroethylene, and the pore size is $\leq 5 \mu\text{m}$.

6 Instruments and equipment

6.1

Sample injection pipeline. should be polytetrafluoroethylene, fluorinated polyethylene propylene, stainless steel that does not react with nitrogen oxides or borosilicate glass.

6.2

Particulate matter filter. installed between the sampling manifold and the instrument inlet. Particle filter other than the filter membrane it should be polytetrafluoroethylene, fluorinated polyethylene propylene, stainless steel or borosilicate glass that does not react with nitrogen oxides.

And other materials. The instrument does not require an external particulate filter if it has a built-in particulate filter.

6.3

Nitrogen oxide analyzer. Divided into dual reaction chamber dual detector type, dual reaction chamber single detector type and single reaction chamber single detection Device, the system components are shown in Figure 1, Figure 2 and Figure 3 respectively. Performance indicators should meet the requirements of HJ 654.

1-air inlet; 2-roof; 3-fan; 4-dehumidifying device; 5-injection pipeline; 6-way valve; 7-zero gas; 8-standard gas; 9- particulate filter;

10-dryer; 11-nitrogen oxide analyzer; 12-nitrogen dioxide converter (molybdenum catalysis); 13-ozone generator; 14-flow controller; 15-reaction Chamber 16-signal output; 17-data output; 18-ozone remover; 19-pump; 20-evacuation port.

Figure 1 Schematic diagram of a dual-reactor dual-detector NO_x measurement system

1-air inlet; 2-roof; 3-fan; 4-dehumidifying device; 5-injection pipeline; 6-way valve; 7-zero gas; 8-standard gas; 9- particulate filter;

10-dryer; 11-nitrogen oxide analyzer; 12-nitrogen dioxide converter (molybdenum catalyst); 13-ozone generator; 14-flow controller; 15-reverse Application room 16-signal output; 17-data output; 18-ozone remover; 19-pump; 20- emptying port.

Figure 2 Schematic diagram of a dual-reactor single-detector NO_x measurement system

1-air inlet; 2-roof; 3-fan; 4-dehumidifying device; 5-injection pipeline; 6-way valve; 7-zero gas; 8-standard gas; 9- particulate filter;

10-dryer; 11- nitrogen oxide analyzer; 12- sequence controller; 13- nitrogen dioxide converter (molybdenum catalysis); 14- ozone generator; 15- flow Controller; 16-reaction chamber; 17-signal output; 18-data output; 19-ozone remover; 20-pump; 21- emptying port.

Figure 3 Schematic diagram of single-reactor single-detector NO_x measurement system

7.1 Installation and commissioning of the instrument

After the newly purchased instrument is installed, various parameters should be set and debugged according to the operation manual. Debugging indicators include zero noise, Minimum detection limit, range noise, indication error, range accuracy, 24 h zero point drift and 24 h range drift.

The detection methods and indicators are implemented in accordance with HJ 193.

7.2 Inspection

During the operation of the instrument, zero point check, range check, linearity check, and converter conversion efficiency check are required.

The method was performed according to Appendix B in HJ 818. If the inspection results are unsatisfactory, the instrument needs to be calibrated, if necessary, the instrument Make repairs.

After the instrument is repaired, perform a linear check and recalibrate the instrument.