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

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**Determination of sulfur trioxide in flue gas from thermal power
plants - Controlled condensation method**

火电厂烟气中SO₃测试方法 控制冷凝法 清晰版

(English Translation)

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Foreword

This standard is in accordance with the rules given in GB/T 1.1-2009 "Guidelines for Standardization Work Part 1: Standard Structure and Compilation" Then drafted.

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction and interpretation of the Environmental Protection Standardization Technical Committee of the Electric Power Industry.

Drafting organizations of this standard. Guodian Environmental Protection Research Institute Co., Ltd., Guodian Nanjing Electric Power Test and Research Co., Ltd., Beijing Jingguodian Longyuan Environmental Engineering Co., Ltd., Fujian Longjing Environmental Protection Co., Ltd., China Datang Group Science and Technology Research Institute Co., Ltd. Central China Branch, Environmental Engineering Evaluation Center of Ministry of Environmental Protection, Nanjing Guodian Environmental Protection Technology Co., Ltd., Guodian Jiang Su Electric Power Co., Ltd., Zhejiang Zheneng Technology Research Institute Co., Ltd., State Grid Xinjiang Electric Power Co., Ltd. Electric Power Research Institute.

1 Scope

This standard specifies different shapes such as gaseous SO₃, aerosol sulfuric acid mist and soluble sulfate in flue gas of thermal power plants.

State SO₃ test method.

This method is suitable for testing SO₃ in flue gas of thermal power plants. SO₃ test in flue gas from stationary sources such as industrial and civil boilers can refer to this standard for implementation.

When the sampling volume is 0.5 m³, the detection limit of this standard method is 0.30 mg/m³.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version is suitable Used in this document. For undated references, the latest version (including all amendments) applies to this document.

GB/T 16157 Determination of particulate matter in exhaust from stationary sources and sampling method of gaseous pollutants GB/T 27025 General requirements for the competence of testing and calibration laboratories

3 Terms and definitions

The following terms and definitions apply to this standard.

Dry flue gas of standard condition the flue gas is moisture-free at a temperature of 273.15 K and a pressure of 101325 Pa. Unless otherwise specified, this standard Refers to the volume and concentration of dry flue gas under standard conditions.

Flue gas humidity

The amount of moisture in the flue gas that coexists with 1 kg of dry flue gas. This standard refers to the volume percentage of water vapor content in wet flue gas.

Controlled condensation method After the temperature is controlled at (240~260)°C by a suitable heating device, the coarse particles are filtered, and the condensing device is controlled to the SO₃ in the flue gas is condensed and trapped, and the SO₃ test method for the analysis of sulfate radicals by the barium perchlorate-thorium reagent titration method.

4 Principle of the method

Use a heated sampling gun to extract a certain amount of flue gas, control the temperature to be maintained between 240 °C and 260 °C, and filter coarse the particulate matter, through the control of the condensing device, the SO₃ is condensed to form a sulfuric acid mist with a suitable particle size, which is trapped under the action of inertial collision;

The sulfuric acid mist that failed to be captured is collected through a secondary filter. Rinse the control condenser and secondary filter with isopropanol solution, and Collect flushing fluid. Use barium perchlorate-thorium reagent to titrate and analyze the SO₄²⁻-concentration in the flushing solution, and calculate it with the sampling volume the concentration of SO₃ in the flue gas.

5.1 Sampling mouth

Determine the size of the sampling nozzle according to Appendix A. It should be ensured that the suction speed of the sampling nozzle is basically equal to the airflow speed at the measuring point.

The relative error is less than ±15%.

5.2 Sampling gun

The heating temperature of the sampling gun should be controlled at (250±10)°C, and there should be a temperature display device. The lining material can be quartz, corrosion-resistant Stainless steel with corrosion performance above 316L.

5.3 Heating filter

It is composed of filter element, heating element and temperature control device. The filter element should be made of ceramic material. For a mark with a diameter of 1.0 μm for quasi-particles, the trapping efficiency of the filter element should be greater than 99.9%. Control the heating temperature (200±10)°C.

5.4 Heating connection pipe

It is composed of air duct, heating device, thermal insulation layer and temperature control device. The air duct should be made of polytetrafluoroethylene. Heating temperature (130±10)°C.

5.5 Control the condenser

The control condenser tube is composed of an inner tube and an outer tube. The inner tube is a serpentine tube, and the material should be glass. The inner diameter of the outer tube is 60 mm, and the inner the inner diameter of the tube is 4 mm, the inner tube circle

diameter is 36 mm, the inner tube circle distance is 15 mm, and the length of the inner tube from point A to point B is not less than 2400 mm, see Figure 1.

Figure 1 Schematic diagram of control condenser

5.6 Temperature control water bath device

The temperature control range of the temperature control water bath device is (50~90)°C, and the adjustment accuracy is $\pm 1^\circ\text{C}$.

5.7 Secondary filter

The material of the secondary filter should be PTFE or quartz. For standard particles with a diameter of 0.3 μm , secondary filtration the collection efficiency of the filter should be greater than 99.5%.

5.8 Air pump

The pump flow rate should be adjustable within the range of (6~15) L/min, with temperature and pressure measurement functions before the flowmeter.

5.9 Flowmeter

Used for measuring sampling flow, it shall have the function of measuring sampling instantaneous flow and cumulative flow, and the error shall not exceed $\pm 2.0\%$.

5.10 Dryer

The dehumidification device for sampling flue gas is set in front of the flow meter.

6 Preparation of reagents and solutions

Unless otherwise specified, use analytical reagents that meet national standards. The experimental water is deionized water.

6.1

Barium perchlorate trihydrate ($\text{Ba}(\text{ClO}_4)_2 \cdot 3\text{H}_2\text{O}$). excellent grade pure.

6.2

Isopropanol. $\rho((\text{CH}_3)_2\text{CHOH}) = 0.79 \text{ g/ml}$.

6.3

Sodium hydroxide (NaOH).