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HJ

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

HJ 543-2009

**Stationary source emission. Determination of mercury. Cold
atomic absorption spectrophotometry**

固定污染源废气 汞的测定 冷原子吸收分光光度法(暂行)

(English Translation)

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Foreword

To protect the environment and protect people in order to implement the Environmental Protection Law of the People's Republic of China and the Law of the People's Republic of China on the Prevention and Control of Air Pollution this standard is formulated for physical health and monitoring methods for monitoring mercury in waste gas from stationary sources.

This standard specifies the cold atomic absorption spectrophotometric method for the determination of mercury in exhaust gases from stationary sources.

This standard was formulated by the Science and Technology Standards Department of the Ministry of Environmental Protection.

This standard was drafted. Beijing Environmental Protection Monitoring Center.

This standard was approved by the Ministry of Environmental Protection on December 30, 2009.

This standard has been implemented since April 1, 2010.

This standard is explained by the Ministry of Environmental Protection.

Determination of mercury in fixed pollution sources - Cold atomic absorption spectrophotometric method (provisional) Warning. Mercury and its compounds are very toxic and should be ventilated during operation; the mercury-containing exhaust gas after the reaction is discharged before discharge.

Adsorption with iodine-activated carbon to avoid contamination of the air; residual residue after detection should be properly and safely disposed.

1 Scope of application

This standard specifies the cold atomic absorption spectrophotometric method for the determination of mercury in exhaust gases from stationary sources.

This standard applies to the determination of mercury in fixed pollution source exhaust gas.

The detection limit of the method is 0.025 µg/25 ml. When the sampling volume is 10 L, the detection limit is 0.002 5 mg/m³.

Limited to 0.01 mg/m³.

2 Normative references

The contents of this standard refer to the following documents or their terms. For undated references, the valid version applies to this standard.

GB/T 16157 Determination of particulate matter in fixed pollution source exhaust gas and sampling method of gaseous pollutants HJ/T 373 Technical Specifications for Quality Assurance and Quality Control of Fixed Pollution Source Monitoring (Trial) GB/T 6682 Analytical laboratory water specifications and test methods

3 Principle of the method

Mercury in the exhaust gas is absorbed by the acidic potassium permanganate solution and oxidized to form mercury ions, which are reduced to atomic mercury by stannous chloride.

The gas is blown from the solution into the mercury analyzer and measured by cold atomic absorption spectrophotometry.

4 Interference

Organic substances such as benzene, acetone, etc. interfere with the determination.

5 Reagents and materials

Unless otherwise stated, analytically pure reagents that meet national standards were used for the analysis. Experimental water, GB/T 6682, second grade.

5.1

Concentrated hydrochloric acid. $\rho(\text{HCl}) = 1.19 \text{ g/ml}$, excellent grade pure.

5.2

Sulfuric acid. $\rho(\text{H}_2\text{SO}_4) = 1.84 \text{ g/ml}$, excellent grade pure.

5.3

Potassium permanganate (KMnO_4). excellent grade pure.

5.4

Mercuric chloride (HgCl_2). excellent grade.

5.5

Sulfuric acid solution. $\phi(\text{H}_2\text{SO}_4) = 10\%$.

Measure 10.0 ml of sulfuric acid (5.2) into 100 ml of water.

5.6

Sulfuric acid solution. $c(1/2 \text{ H}_2\text{SO}_4) = 0.5 \text{ mol/L}$.

Add 6.9 ml of sulfuric acid (5.2) to 400 ml of water, cool and dilute to 500 ml with water.

5.7

Sulfuric acid solution. $c(1/2 \text{ H}_2\text{SO}_4) = 1.0 \text{ mol/L}$.

Add 13.8 ml of sulfuric acid (5.2) to 400 ml of water, cool and dilute to 500 ml with water.

5.8

Potassium permanganate solution. $c(1/5 \text{ KMnO}_4) = 0.1 \text{ mol/L}$.

Weigh 3.2 g of potassium permanganate (5.3), dissolve in water and dilute to 1 000 ml.

After filtration, the filtrate was stored in a brown bottle for use.

5.9 Absorbent

Mix 0.1 mol/L potassium permanganate solution (5.8) with 10% sulfuric acid solution (5.5) in an equal volume and prepare before use.

5.10 Stannous chloride glycerol solution. $w(\text{SnCl}_2 \cdot 2\text{H}_2\text{O}) = 25\%$.

Weigh 25.0 g of stannous chloride ($\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$) in a 150 ml beaker, add 10.0 ml of concentrated hydrochloric acid (5.1), stir and dissolve.

Add 90 ml of glycerin, cool and store in a brown bottle.

Note: The stannous chloride glycerol solution is poured into the mercury reaction bottle before use, and the background mercury is removed by blowing nitrogen gas until the mercury meter reading returns to zero.

5.11 Hydroxylamine hydrochloride solution. $w(\text{NH}_2\text{OH} \cdot \text{HCl}) = 10\%$.

Weigh 10.0 g of hydroxylamine hydrochloride ($\text{NH}_2\text{OH} \cdot \text{HCl}$) dissolved in a small amount of water and diluted to 100 ml with water.

5.12 Mercury standard stock solution. $\rho(\text{Hg}) = 1\,000\ \mu\text{g}/\text{ml}$.

Weigh 0.135 4 g of mercury chloride (5.4), dissolve it in 0.5 mol/L sulfuric acid solution (5.6), and transfer it to a 100 ml volumetric flask to 0.5 mol/L.

The sulfuric acid solution (5.6) is diluted to the mark. This solution contains 1 000 μg of mercury per ml.

A commercially available certified standard solution can also be used as a standard stock solution for mercury.

5.13 Mercury standard intermediate. $\rho(\text{Hg}) = 10.0\ \mu\text{g}/\text{ml}$.

Pipette 1.00 ml of the standard stock solution of mercury chloride (5.12), transfer it to a 100 ml volumetric flask, and dilute with 0.5 mol/l sulfuric acid solution (5.6).

To the mark, this solution is equivalent to 10.0 μg of mercury per milliliter.

5.14 Mercury standard use solution. $\rho(\text{Hg}) = 1.00\ \mu\text{g}/\text{ml}$.

Before use, draw 10.00 ml of mercury chloride standard intermediate solution (5.13), transfer it to a 100 ml volumetric flask, and use 0.5 mol/L sulfuric acid solution.

(5.6) Dilute to the marking. This solution is equivalent to 1.00 μg of mercury per milliliter.

5.15 Iodine - activated carbon

Weigh 10 g of iodine (I_2) and 20 g of potassium iodide (KI) in a beaker, then add 200 ml of distilled or deionized water to form a solution.

Then add about 100 g of activated carbon to the solution, stir vigorously until the solution is decolorized, then pour out the solution, and dry the activated carbon at 100-110 ° C.

Use in a desiccator.

5.16 Nitrogen (N_2). purity $\phi(\text{N}_2) = 99.999\%$.