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

HJ 489-2009

Replacing GB 11909-1989

**Water quality. Determination of silver. Spectrophotometric
method with 3, 5-Br₂-PADAP**

水质 银的测定 3,5-Br₂-PADAP分光光度法
(English Translation)

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Foreword

To protect the environment and protect the human body 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 Water Pollution Prevention and Control this standard is developed for the monitoring of health and the regulation of silver in water and wastewater.

This standard specifies the method for determining silver in water and wastewater.

This standard amends the determination of mercury in water, 3,5-Br₂-PADAP spectrophotometry (GB 11909-89), the original standard the drafting unit is the China National Environmental Monitoring Center. This is the first revision.

The main revisions are as follows.

-- Increase coexisting ion interference and elimination and adjust and revise the standard text.

From the date of implementation of this standard, the national environmental protection

standard "Water" approved and issued by the former National Environmental Protection Agency on December 25, 1989 the determination of silver, 3,5-Br₂-PADAP spectrophotometry (GB 11909-89) was abolished.

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

This standard is mainly drafted by. China Environmental Monitoring Center.

This standard was approved by the Ministry of Environmental Protection on September 27, 2009.

This standard has been implemented since November 1, 2009.

This standard is explained by the Ministry of Environmental Protection.

Determination of silver in water quality 3,5-Br₂-PADAP spectrophotometry

1 Scope of application

This standard specifies 3,5-Br₂-PADAP([2-(3,5)-dibromo-2-pyridylazo]-5-diethylaminophenol) for the determination of silver in water and wastewater.

Photometric method.

This standard is applicable to silver in industrial wastewater from the production of surface water and photosensitive materials contaminated by silver, film printing, silver plating, smelting and other industries.

Determination.

When the test volume is 25 ml and the optical path is 10 mm cuvette, the detection limit of this method is 0.02 mg/L, and the lower limit of determination is 0.08 mg/L.

The upper limit of determination is 1.0 mg/L.

2 Principle of the method

Silver and 3,5-Br₂-PADAP are stable in the presence of 1% sodium lauryl sulfate in an acetate buffer medium at pH 4.5-8.5 the 1.2 magenta complex, whose absorbance is proportional to the concentration of silver. The maximum absorption wavelength of the complex is 570 nm; the maximum absorption of the reagent the wavelength was 470 nm; the molar absorptivity was 7.6×10^4 L/(mol·cm).

3 Reagents and materials

The reagents used in this standard are analytically pure reagents that meet the national standards unless otherwise stated. The experimental water is newly prepared.

Ionic water or distilled water.

3.1

Nitric acid (HNO₃). $\rho = 1.40$ g/ml.

3.2

Sulfuric acid (H₂SO₄). $\rho = 1.84$ g/ml.

3.3

Perchloric acid (HClO₄). $\rho = 1.68$ g/ml.

3.4

Hydrogen peroxide (H₂O₂). 30%.

3.5

Nitric acid (HNO₃) 1 1 solution. Add appropriate amount of nitric acid (3.1) to an equal volume of water and mix.

3.6

Nitric acid (HNO₃) solution, ρ (HNO₃) = 1 mol/L. Prepared with nitric acid (3.1).

3.7

Sulfuric acid (H₂SO₄) 1 1 solution. Add appropriate amount of sulfuric acid (3.2) to an equal volume of water and mix.

3.8

Sodium hydroxide (NaOH) solution, ρ (NaOH) = 1 mol/L. Weigh 40 g of sodium hydroxide dissolved in water and dilute to 1 L.

3.9

Hydrogen peroxide solution (H₂O₂), ρ (H₂O₂) = 3% (volume fraction). Take 10 ml of hydrogen peroxide (3.4) and dilute to 100 ml with water.

3.10 EDTA-2Na solution, ρ (EDTA-2Na)=0.1 mol/L. dissolve 37.24 g EDTA-2Na (C₁₀H₁₄N₂O₃Na₂·2H₂O)

In water, and diluted to 1 000 ml.

3.11 Sodium citrate solution, $\rho = 50$ g/L. Weigh 50 g of sodium citrate, dissolve in water, and dilute to 1 000 ml.

3.12 sodium lauryl sulfate (sls) solution, $\rho = 10 \text{ g/L}$. Weigh 1 g of sodium lauryl sulfate in 100 ml of water.

3.13 Acetic acid-sodium acetate buffer solution, $\text{pH}=5$. Mix with 1 mol/L sodium acetate and 1 mol/L acetic acid solution under the pH meter to the desired pH.

3.14 3,5-Br₂-PADAP ethanol solution, $\rho(3,5\text{-Br}_2\text{-PADAP})=0.3 \text{ g/L}$. dissolve 0.03 g 3,5-Br₂-PADAP in 100 ml anhydrous in ethanol.

3.15 Silver standard stock solution, $\rho(\text{Ag})=1.00 \text{ mg/ml}$. accurately weigh 0.157 5 g silver nitrate, add 10 ml nitric acid solution (3.6), dissolve After dissolving, transfer to a 100 ml volumetric flask, dilute to the mark with water, shake well, and store in a brown bottle.

3.16 Silver standard use solution, $\rho(\text{Ag})=0.100 \text{ mg/ml}$. Transfer 10.00 ml of silver standard stock solution (3.15) to a 100 ml volumetric flask Add 2 ml of nitric acid solution (3.5), dilute to the mark with water, store in a brown glass bottle and store in the dark.

3.17 Silver standard use solution, $\rho(\text{Ag})=5.0 \text{ }\mu\text{g/ml}$. Transfer 5.00 ml of silver standard solution (3.16) to a 100 ml volumetric flask.

Dilute to the mark with water and configure before use.

3.18 methyl orange indicator solution, $w(\text{methyl orange}) = 10\%$. 0.1 g of methyl orange (methy orange) was dissolved in water and diluted to 100 ml.

4 Instruments and equipment

4.1

Spectrophotometer and 10 mm quartz cuvette.

4.2

pH meter.

4.3 100 ml, 1 000 ml volumetric flask.

5 Interference and elimination

Add 2 ml of masking agent 0.1 mol/L EDTA-2Na solution to mask 50 μg of Co²⁺ and Bi³⁺, 100 μg of each of Cr³⁺, Ba²⁺ and Sr²⁺.

200 μg of Cd²⁺, Cu²⁺, Pb²⁺, Ni²⁺, Mn²⁺, VO₃⁻, Hg²⁺, 400 μg of Fe²⁺, 500 μg of Fe³⁺, Al³⁺, Mg²⁺, K, the effect of 1 000 μg of Na and Ca²⁺ on the determination of 5.0 μg Ag. Cl⁻, Br⁻, I⁻, S₂O₃²⁻, SCN⁻ and S²⁻ produce negative interference and are easy to use Strong acid is decomposed and removed when digesting the water sample.