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# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

# GB/T 43753.2-2024

**Methods for chemical analysis of precious metals alloys electroplating wastewater - Part 2: Determination of zinc, manganese, chromium, cadmium, lead, iron, aluminium, nickel, copper and beryllium contents - Inductively coupled plasma atomic emission spectrometry**

贵金属合金电镀废水化学分析方法 第2部分：锌、锰、铬、镉、铅、铁、铝、镍、铜、铍含量的测定 电感耦合等离子体原子发射光谱法

**Issued on: March 15, 2024** **Implemented on: October 1, 2024**

**Issued by: State Administration for Market Regulation;**
**Standardization Administration of the PRC**

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## Foreword

This document was issued on 15 March 2024 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 October 2024.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

## 1 Scope

GB/T 43753.2-2024 is Part 2 of the Chinese analytical series for the wastewater of precious metal alloy electroplating and electroforming, and determines zinc, manganese, chromium, cadmium, lead, iron, aluminium, nickel, copper and beryllium by inductively coupled plasma atomic emission spectrometry. The matrix is the difficulty: plating effluent carries high and variable dissolved salt, complexing agents and sometimes cyanide, and the ten elements sought span four orders of magnitude in concentration, so the spectral line has to be chosen against interference rather than for sensitivity alone. The standard sets the principle, the reagents and materials, the instruments, the samples and their handling, the test procedure, the processing of the experimental data, the precision and the test report, with

informative annexes giving the recommended analytical wavelengths and instrument operating parameters and the original precision test data. It took effect on 1 October 2024.

This document describes a method for determining the contents of zinc, manganese, chromium, cadmium, lead, iron, aluminum, nickel, copper, and beryllium in wastewater from electroplating and electroforming of precious metal alloys using inductively coupled plasma atomic emission spectrometry.

This document applies to the determination of zinc, manganese, chromium, cadmium, lead, iron, aluminum, nickel, copper, and beryllium contents in wastewater from precious metal alloy electroplating and electroforming. The determination range for zinc, manganese, chromium, cadmium, lead, iron, aluminum, nickel, copper, and beryllium is 0.0001 mg/mL~0.1000 mg/mL.



## 2 Normative references

The provisions of the following documents constitute the essential clauses of this document through normative references in this text. Among them, for any dated reference, only the version corresponding to that date applies to this document; for any undated reference, the latest version (including all amendments) applies to this document.

GB/T 6682 Water for analytical laboratory use - Specification and test methods

## 3 Terms and definitions

This document does not contain any terms or definitions that need to be defined.

## 4 Principle

After the organic matter in the test specimen is digested with perchloric acid, it is dissolved in a mixed acid. The contents of zinc, manganese, chromium, cadmium, lead, iron, aluminum, nickel, copper and beryllium are determined by inductively coupled plasma atomic emission spectrometry in the mixed acid medium.

## 5 Reagents and materials

Unless otherwise specified, only reagents confirmed to be of analytical grade shall be

used in the analysis.

5.1 Water, GB/T 6682, Grade II.

5.2 Perchloric acid (rho=1.76 g/mL).

5.3 Nitric acid (rho=1.42 g/mL).

5.4 Hydrochloric acid (rho=1.18 g/mL).

5.5 Hydrogen peroxide (rho=1.11 g/mL)

5.6 Nitric acid (1+1).

5.7 Hydrochloric acid (1+1).

5.8 Mixed acid (1+3+4). Mix 1 volume of nitric acid (5.3), 3 volumes of hydrochloric acid (5.4) and 4 volumes of water (5.1) thoroughly, and prepare fresh before use.

5.9 Zinc standard stock solution. Weigh 0.1000 g of metallic zinc (wZn>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100 mL plastic volumetric flask, and dilute to the mark with water (5.1). Mix well. 1 mL of this solution contains 1 mg of zinc.

5.10 Manganese standard stock solution. Weigh 0.1000 g of metallic manganese (wMn>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100 mL plastic volumetric flask, dilute to the mark with water (5.1), and mix well. 1 mL of this solution contains 1 mg of manganese.

5.11 Chromium standard stock solution. Weigh 0.1000 g of metallic chromium (wCr>=99.99%) and place it in a 100 mL PTFE beaker. Add 1 mL of nitric acid (5.6) and 5 mL of hydrochloric acid (5.7). Cover with a PTFE beaker lid, heat to dissolve, transfer to a 100 mL plastic volumetric flask, add 10 mL of hydrochloric acid (5.7), and dilute to the mark with water (5.1). Mix well. 1 mL of this solution contains 1 mg of chromium.

5.12 Cadmium standard stock solution. Weigh 0.1000 g of metallic cadmium (wCd>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100

mL plastic volumetric flask, and dilute to the mark with water (5.1). Mix well. 1 mL of this solution contains 1 mg of cadmium.

5.13 Lead standard stock solution. Weigh 0.1000 g of metallic lead (wPb>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100 mL plastic volumetric flask, and dilute to the mark with water (5.1). Mix well. 1 mL of this solution contains 1 mg of lead.

5.14 Iron standard stock solution. Weigh 0.1000 g of metallic iron (wFe>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100 mL plastic volumetric flask, and dilute to the mark with water (5.1). Mix well. 1 mL of this solution contains 1 mg of iron.

5.15 Aluminum standard stock solution. Weigh 0.1000 g of metallic aluminum (wAl>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of hydrochloric acid (5.7), heat to dissolve, cool to room temperature, transfer to a 100 mL plastic volumetric flask using hydrochloric acid (5.7), dilute to the mark with water (5.1), and mix well. 1 mL of this solution contains 1 mg of aluminum.

5.16 Nickel standard stock solution. Weigh 0.1000 g of metallic nickel (wNi>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100 mL plastic volumetric flask, and dilute to the mark with water (5.1). Mix well. 1 mL of this solution contains 1 mg of nickel.

5.17 Copper standard stock solution. Weigh 0.1000 g of metallic copper (wCu>=99.99%) and place it in a 100 mL PTFE beaker. Add 20 mL of nitric acid (5.6), heat to dissolve, remove nitrogen oxides, cool to room temperature, transfer to a 100 mL plastic volumetric flask, dilute to the mark with water (5.1), and mix well. 1 mL of this solution contains 1 mg of copper.

5.18 Beryllium standard stock solution. Weigh 0.1000 g of metallic beryllium