

HG

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

HG/T 4823-2023

Replacing HG/T 4823-2015

Manganese sulfate for batteries

电池用硫酸锰

(English Translation)

Issued on: July 28, 2023

Implemented on: February 1, 2024

**Issued by: Ministry of Industry and Information Technology of the
People's Republic of China**

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1 Scope

This document specifies the classification, requirements, test methods, inspection rules, marking and accompanying documents, packaging, transportation, storage of manganese sulfate for batteries.

This document is applicable to manganese sulfate for batteries.

Note: This product is mainly used to prepare precursors for positive electrode materials of secondary lithium batteries (nickel-cobalt-manganese ternary composite hydroxides, nickel-manganese ternary hydroxides, etc.); it can also be used to manufacture other manganese salts.

2 Normative references

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

GB/T 191-2008 Packaging - Pictorial marking for handling of goods

GB/T 6003.1-2022 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth

GB/T 6678 General principles for sampling chemical products

GB/T 6682-2008 Water for analytical laboratory use - Specification and test methods

GB/T 8170 Rules of rounding off for numerical values and expression and judgement of limiting values

HG/T 2962-2010 Manganous sulphate for industrial use

HG/T 3696.1 Inorganic chemicals for industrial use - Preparations of standard and reagent solutions for chemical analysis - Part 1: Preparations of standard volumetric solutions

HG/T 3696.2 Inorganic chemicals for industrial use - Preparations of standard and reagent solutions for chemical analysis - Part 2: Preparations of standard solutions for impurity

3 Terms and definitions

There are no terms and definitions that need to be defined in this document.

4 Molecular formula and relative molecular mass

Molecular formula of solid product. $\text{MnSO}_4 \cdot \text{H}_2\text{O}$ Relative molecular mass. 169.01 (according to the 2022 international relative atomic mass)

5 Classification

Manganese sulfate products for batteries are divided into two categories according to the form of the product.

6 Requirements

6.1

Appearance. Category I is light pink white powder; Category II is light red solution.

6.2

Category I manganese sulfate solid for batteries shall comply with the provisions of Table 1,

6.3

Manganese sulfate solution for category II batteries shall comply with the requirements of Table 2, when tested according to the test method specified in this document.

7 Test method

Warning. Some reagents used in this test method are corrosive, so be careful when operating!

7.4

Determination of the content of iron, zinc, copper, lead, cadmium, chromium, potassium, sodium, calcium, magnesium, nickel, cobalt, aluminum

7.1 General provisions

The reagents and water used in this document, unless otherwise specified, refer to analytical reagents and grade 3 water specified in Table 1 of GB/T 6682-2008.

The standard titration solutions, impurity standard solutions, preparations and products used in the test, unless otherwise specified, are prepared in accordance with the provisions of HG/T 3696.1, HG/T 3696.2, HG/T 3696.3.

7.2 Appearance inspection

Under natural light, place the solid product on a white-backed watch glass or white porcelain plate; place the solution product in a beaker; judge the appearance by visual inspection.

7.3.1 Principle

In an ammonia-ammonium chloride buffer solution with a pH of about 10, use chrome black T as an indicator and use disodium ethylenediaminetetraacetic acid (EDTA) standard titration solution to titrate, until the solution changes from purple-red to pure blue, which is the end point. Calculate the manganese sulfate content based on the consumption of the standard titration solution.

7.4.1 Principle

The specimen is dissolved in nitric acid; the intensity of the characteristic spectrum of the elements to be measured (iron, zinc, copper, lead, cadmium, chromium, potassium, sodium, calcium, magnesium, nickel, cobalt, aluminum) is determined by inductively coupled plasma emission spectrometer; the working curve method is used for quantification.

7.4.2.1 Nitric acid solution. 1+1

Prepared with high-grade pure reagents.

7.4.3 Instruments and equipment

Inductively coupled plasma emission spectrometer.

7.5.2 Instruments and equipment

Atomic absorption spectrophotometer. Equipped with a lead hollow cathode lamp.

7.5.4.1 Data processing of solid specimen

The lead content is calculated as the mass fraction of lead w_4 according to formula (6).

7.6.2.1 Principle

The specimen is dissolved in water, separated by anion exchange column using an ion chromatograph, detected by suppressed conductivity method, quantified by external standard method (peak area/peak height). The mass concentration of chlorine is found from the working curve and its content is calculated.

7.7.3 Test steps

Weigh about 20 g (accurate to 0.01 g) of the specimen. Place it in a 250 mL beaker.

Dissolve it in 200 mL hot water without carbon dioxide. Filter it with a glass crucible that has been dried at $105\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ to a constant mass. Wash it with hot water until there is no sulfate (check with barium chloride solution). Place it in an electric constant temperature drying oven, to dry it at $105\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ to a constant mass.

7.7.4 Test data processing

The water-insoluble content is expressed as mass fraction w_7 and is calculated according to formula (12).

7.8.1 Instruments and equipment

Acidity meter. The graduation value is 0.1 pH unit; it is equipped with pH electrode and calomel electrode.

7.8.2 Test steps

Solid product. Determine according to the method specified in 5.8 of HG/T 2962-2010.

Solution product. Take 50 mL of liquid specimen. Place it in a dry beaker. Determine the pH with an acidity meter.

7.9.1 Instruments and equipment

Test sieve. $\phi 200 \times 50-0.4/0.25$ GB/T 6003.1-2022, equipped with sieve cover and sieve bottom.