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CHEMICAL INDUSTRY STANDARD OF
THE PEOPLE'S REPUBLIC OF CHINA

ICS 71.060.50

G 12

Filing No.: 65289-2018

HG/T 2225-2018

Replacing HG/T 2225-2010

Aluminum sulfate for industrial use

工业硫酸铝

Issued on: October 22, 2018

Implemented on: April 01, 2019

Issued by: Ministry of Industry and Information Technology of PRC

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Aluminum sulfate for industrial use

1 Scope

This standard specifies the classification, requirements, test methods, inspection rules, signs, labels, packaging, transportation, storage of aluminum sulfate for industrial use.

This standard applies to aluminum sulfate for industrial use. This product is mainly used in papermaking, printing and dyeing, tanning and titanium dioxide post-processing, etc. It is also used in the production of fire-fighting materials, wood protective agents, catalyst carriers. It can also be used for sludge dehydration, concrete quick-setting, etc.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

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

GB/T 3049-2006 Chemical products for industrial use - General method for determination of iron content - 1,10-Phenanthroline spectrophotometric method

GB/T 6678 General principles for sampling chemical products

GB/T 6680 General rules for sampling liquid chemical products

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

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

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

HG/T 3696.3 Inorganic chemicals for industrial use - Preparations of standard and reagent solutions for chemical analysis - Part 3: Preparations of reagent solutions

during operation! If necessary, it must be carried out in a fume hood. If it splashes on your skin or eyes, rinse with water immediately. In severe cases, seek medical attention immediately.

6.2 General provisions

The reagents and water used in this standard refer to analytically pure reagents and grade three water, which is specified in GB/T 6682, unless otherwise specified. The standard titration solutions, impurity standard solutions, preparations, products used in the test shall be prepared, in accordance with the provisions of HG/T 3696.1, HG/T 3696.2, HG/T 3696.3, unless otherwise specified.

6.3 Appearance judgment

The appearance of solid samples is determined visually, on a watch glass or white porcelain plate with a white substrate under natural light. The liquid sample is placed in a sample cup; the appearance is visually determined on a white substrate under natural light.

6.4 Determination of aluminum oxide content

6.4.1 Zinc chloride titration method (arbitration method)

6.4.1.1 Principle

The aluminum in the specimen reacts with excess disodium ethylenediaminetetraacetate (EDTA) to form a complex. When the pH is about 6, use xylenol orange as an indicator; use zinc chloride standard titration solution to titrate excess disodium ethylenediaminetetraacetate (EDTA), to calculate the aluminum oxide content.

6.4.1.2 Reagents or materials

6.4.1.2.1 Hydrochloric acid solution: 1 + 1.

6.4.1.2.2 Sodium acetate solution: 189 g/L.

It is prepared with anhydrous sodium acetate.

6.4.1.2.3 Zinc chloride standard titration solution: $c(\text{ZnCl}_2) \approx 0.025 \text{ mol/L}$.

It is prepared according to HG/T 3696.1. Dilute it 4 times.

6.4.1.2.4 Disodium ethylenediaminetetraacetate (EDTA) standard titration solution: $c(\text{EDTA}) \approx 0.05 \text{ mol/L}$.

6.4.1.2.5 Xylenol orange indicator liquid: 2 g/L.

6.4.1.3 Test procedures

6.4.1.3.1 Preparation of test solution

Weigh about 5 g of solid specimen or about 13 g of liquid specimen (accurate to 0.0002 g). Place it in a 250 mL beaker. Add 100 mL of water and 2 mL of hydrochloric acid solution. Heat to dissolve it. Boil it for 5 minutes (filter if necessary). Cool it. Transfer all to a 500 mL volumetric flask. Use water to dilute to the mark. Shake well. This solution is the test solution A, which is used for the determination of aluminum oxide content and iron content.

6.4.1.3.2 Test

Use a pipette to transfer 20 mL of test solution A in a 250 mL conical flask. Then use a pipette, to add 20 mL of disodium ethylenediaminetetraacetic acid (EDTA) standard titration solution. Boil for 1 minute. Cool it. Add 5 mL of sodium acetate solution and 2 drops of xylenol orange indicator solution. Use zinc chloride standard titration solution for titration, until light pink, which is the end point.

At the same time, conduct the blank test in the same way. Except that no specimen is added to the blank test solution, the types and volume of other reagents added (except the standard titration solution) are the same as the test solution.

6.4.1.4 Test data processing

The aluminum oxide content is calculated as the mass fraction w_1 of aluminum oxide (Al_2O_3), according to formula (1):

$$w_1 = \frac{c(V_0 - V_1) \times M_1 \times 10^{-3}}{m \times (20/500)} \times 100\% - \frac{M_1}{M_2} \cdot w_2 \quad \dots\dots\dots (1)$$

Where:

c - The exact value of the concentration of the zinc chloride standard titration solution, in moles per liter (mol/L);

V_0 - The volume of zinc chloride standard titration solution, which is consumed for titration of the blank test solution, in milliliters (mL);

V_1 - The volume of zinc chloride standard titration solution, which is consumed for titration of the test solution, in milliliters (mL);

m - The value of the mass of the sample, in grams (g);

M_1 - The value of the molar mass of aluminum oxide ($\frac{1}{2}\text{Al}_2\text{O}_3$), in grams per mole (g/mol) ($M_1 = 50.98$);

M_2 - Numerical value for the molar mass of iron (Fe), in grams per mole (g/mol)

room temperature. Add 2 drops of methyl orange indicator solution. Use ammonia solution to adjust the color of the test solution from red to yellow. Then add 2 drops of hydrochloric acid solution and 15 mL of acetic acid-sodium acetate buffer solution. Boil it for 2 minutes. Add 5 ~ 6 drops of 1-(2-pyridylazo)-2-naphthol (PAN) indicator. Cool slightly (about 95 °C). Use copper sulfate standard titration solution to make titration, until bright purple, which is the end point.

At the same time, conduct the blank test in the same way. Except that no specimen is added to the blank test solution, the types and volumes of other reagents added (except the standard titration solution) are the same as the test solution.

6.4.2.4 Test data processing

The aluminum oxide content is calculated based on the mass fraction w_1 of aluminum oxide (Al_2O_3), according to formula (2):

$$w_1 = \frac{c(V_0 - V_1) \times M_1 \times 10^{-3}}{m \times (20/500)} \times 100 \% - \frac{M_1}{M_2} \cdot w_2 \quad \dots\dots\dots (2)$$

Where:

c - The exact value of the concentration of the copper sulfate standard titration solution, in moles per liter (mol/L);

V_0 - The volume of copper sulfate standard titration solution, which is consumed for titrating the blank test solution, in milliliters (mL);

V_1 - The volume of copper sulfate standard titration solution, which is consumed for titration of the test solution, in milliliters (mL);

m - The value of the mass of the sample, in grams (g);

M_1 - The value of the molar mass of aluminum oxide ($\frac{1}{2}\text{Al}_2\text{O}_3$), in grams per mole (g/mol) ($M_1 = 50.98$);

M_2 - The numerical value of the molar mass of iron (Fe), in grams per mole (g/mol) ($M_2 = 55.85$);

w_2 - Iron (Fe) content measured in 6.5.

Take the arithmetic mean of the parallel measurement results as the measurement result. The absolute difference between the two parallel measurement results shall not be greater than 0.2%.

6.5 Determination of iron content

6.5.1 Principle

Same as Chapter 3 of GB/T 3049-2006.

6.5.2 Reagents or materials

Same as Chapter 4 of GB/T 3049-2006.

6.5.3 Instruments and equipment

Spectrophotometer: It is equipped with cuvette, which has an optical path length of 1 cm, 4 cm or 5 cm.

6.5.4 Test procedures

6.5.4.1 Drawing of standard curve

According to the provisions of 6.3 in GB/T 3049-2006, the category I products use a 4 cm or 5 cm cuvette and the corresponding consumption of iron standard solution; the category II products use a 1 cm cuvette and the corresponding consumption of iron standard solution, to draw a standard curve.

6.5.4.2 Test

Use a pipette to transfer 40 mL of category I product or 3 mL ~ 5 mL of category II product test solution A (see 6.4.1.3.1). Place it in a 100 mL volumetric flask. Operate subsequently according to the procedures in GB/T 3049-2006 from 6.4 "If necessary, add water to 60 mL...".

Conduct a blank test at the same time. Except that no specimen is added to the blank test solution, the types and volumes of other reagents added are the same as those of the test solution. Find the corresponding iron mass from the standard curve.

6.5.5 Test data processing

The iron content is calculated as the mass fraction w_2 of iron (Fe), according to formula (3):

$$w_2 = \frac{(m_1 - m_2) \times 10^{-3}}{m \times (V/500)} \times 100 \% \quad \dots\dots\dots (3)$$

Where:

m_1 - The mass of iron in the test solution as found from the standard curve, in milligrams (mg);

m_2 - The mass of iron in the blank test solution as found from the standard curve, in milligrams (mg);

m - The mass of the sample, which is weighed in 6.4.1.3.1, in grams (g);

grams (g);

m_2 - The mass of the glass sand crucible, in grams (g);

m - The numerical value of the mass of the sample, in grams (g).

Take the arithmetic mean of the parallel measurement results as the measurement result. The absolute difference between the two parallel measurement results shall not be greater than 0.01%.

6.7 Determination of pH

6.7.1 Reagents or materials

Carbon dioxide-free water.

6.7.2 Instruments and equipment

Acidometer: The graduation value is 0.1, which is equipped with saturated calomel electrode and glass electrode.

6.7.3 Test procedures

Weigh $1.00\text{ g} \pm 0.01\text{ g}$ of solid specimen or $2.50\text{ g} \pm 0.01\text{ g}$ of liquid specimen. Place it in a 100 mL beaker. Add about 50 mL of carbon dioxide-free water to dissolve it. Transfer all to a 100 mL volumetric flask. Use carbon dioxide-free water to dilute it to the mark. Shake well. Measure with an acidometer.

Take the arithmetic mean of the parallel measurement results as the measurement result. The absolute difference between the two parallel measurement results shall not be greater than 0.1 pH unit.

7 Inspection rules

7.1 All items specified in this standard are exit-factory inspection items.

7.2 The aluminum sulfate for industrial use of the same category and grade, which is produced by the production enterprise, using the same materials and basically the same production conditions continuously or by the same shift, forms one batch. Each batch of products shall not exceed 150 t.

7.3 Determine the number of sampling units, according to the provisions of GB/T 6678. When sampling solid products, insert the sampler diagonally from the top of the packaging bag to 3/4 of the depth of the material layer, to take sample. After mixing the collected samples, reduce them into no less than 500 g, according to the quartering method. For liquid products, it shall be sampled in accordance with GB/T 6680; mix the collected samples evenly and the sample volume shall not be less than 500 mL.

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