

ICS 67.220.20
CCS X 40



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

GB 29210-2012

Food additive copper sulphate

食品添加剂 硫酸铜

(English Translation)

Issued on: December 25, 2012

Implemented on: January 25, 2013

Issued by: Ministry of Health of the People's Republic of China

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1 Scope

This standard applies to copper oxide and sulfuric acid reaction prepared by the food additive copper sulfate.

2.1 Chemical name

Copper sulfate pentahydrate

2.2 Molecular formula

$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

2.3 Relative molecular mass

249.7 (according to the 2007 International Relative Atomic Quality)

3.1 Sensory requirements

Shall comply with the provisions of Table 1.

Table 1 sensory requirements

The project requires a test method Color blue State granular crystals or powder Take appropriate sample in a 50 mL beaker and observe the color and state under natural light

3.2 Physical and chemical indicators

Shall comply with the provisions of Table 2.

Table 2 Physical and chemical indicators

Item Index Test Method Copper sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) content, w /% 98.0 ~ 102.0
 Appendix A A.4 Hydrogen sulfide does not precipitate, w /% ≤ 0.3 Appendix A A.5 Iron (Fe), w /% ≤ 0.01 Appendix A A.6 Lead (Pb)/(mg/kg) ≤ 4 Appendix A A.7 Arsenic (As)/(mg/kg) ≤ 3 Appendix A A.8 Appendix A Testing method A.1 Warning Some of the reagents used in the test methods of this standard are toxic or corrosive and should be operated with appropriate safety and protective measures.

A.2 General provisions the reagents and water used in this standard, when not specified in other requirements, refer to the analysis of pure reagents and GB/T 6682-2008 in the provisions of the three Water level. Standard titration solution used in the test, the standard solution for the determination of impurities, preparations and products, without any other requirements, GB/T 601, GB/T 602, GB/T 603. The solution used refers to an aqueous solution when it is not specified with any solvent formulation.

A.3 Identification test A.3.1 Reagents and materials A.3.1.1 Hydrochloric acid.

A.3.1.2 Hydrochloric acid solution. 1 4.

A.3.1.3 Hydrochloric acid solution. 1 1.

A.3.1.4 Ammonia solution. 2 3.

A.3.1.5 barium chloride solution. 100 g/L.

A.3.1.6 Lead acetate solution. 80 g/L.

A.3.1.7 Ammonium acetate solution. 100 g/L.

A.3.1.8 potassium ferrocyanide solution. Weigh 1 g of potassium ferrocyanide [$\text{K}_4\text{Fe}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$] and dissolve in 10 mL of water. The solution Liquid is now available.

A.3.2 Identification method A.3.2.1 Identification of copper ions A.3.2.1.1 Take about 1g sample, dissolve in 20mL water, add a small amount of hydrochloric acid acidification sample solution. Will be a bright rusty metal Iron tablets into the acidification of the sample solution, the iron surface will form a red metal copper film.

A.3.2.1.2 Take about 1g sample, dissolve in 20mL water, add excess ammonia solution, first blue precipitate, and then into dark blue Color solution.

A.3.2.1.3 Take about 1g sample, dissolve in 20mL water, add potassium ferrocyanide solution, generate reddish brown precipitate, insoluble in hydrochloric acid Liquid (A.3.1.2).

A.3.2.2 Identification of sulfate ions A.3.2.2.1 Take about 1g sample, dissolve in 20mL water, add barium chloride solution, which produces a white precipitate, this white precipitate is insoluble in hydrochloric acid Solution (A.3.1.3).

A.3.2.2.2 Take about 1g sample, dissolve in 20mL water, add lead acetate solution, which produces white precipitate, this white precipitate dissolved in ammonium acetate Solution.

A.3.2.2.3 Take about 1g sample, dissolve in 20mL water, add hydrochloric acid does not produce precipitation.

A.4 Determination of copper sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) content A.4.1 Methodological Summary in the slightly acidic conditions, the sample by adding excess potassium iodide and divalent copper quantitative reaction, with sodium thiosulfate standard titration solution titration precipitation of iodine, with starch as an indicator, by the color change to determine the end point.

A.4.2 Reagents and materials A.4.2.1 Potassium iodide.

A.4.2.2 Glacial acetic acid.

A.4.2.3 Ammonium thiocyanate solution. 100 g/L.

A.4.2.4 sodium thiosulfate standard titration solution. $c(\text{Na}_2\text{S}_2\text{O}_3) = 0.1\text{mol/L}$.

A.4.2.5 Starch indicator. 10 g/L (for a period of 2 weeks).

A.4.3 Analysis steps Weigh 0.8g ~ 1.0g sample, accurate to 0.0002g, placed in 250mL iodine bottle, add 50mL water dissolved, add 4mL ice Acetic acid and 3g potassium iodide, shake, placed in the dark place 10min. Titration with sodium thiosulfate standard titration solution to the solution was pale yellow, plus Into the 3mL starch indicator solution, continue to titration to the solution was light blue, add 20mL ammonium thiocyanate solution, shake. Continue titration to solution blue Color disappears, that is the end.

While the blank test. Blank test in addition to no sample, the other operations and the type and amount of reagents added (standard titration solution and the same).

A.4.4 Calculation of results the mass fraction w_1 of copper sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) is calculated according to formula (A.1) $w_1 = [(V_1 - V_0)/1000] cM m \times 100\%$ (A.1) where.

V_1 --- titration sample solution consumed sodium thiosulfate standard titration solution volume value in milliliters (mL);

V_0 --- titration blank sample solution consumed by sodium thiosulfate standard titration solution volume in milliliters (mL);

c - the exact value of the concentration of sodium thiosulfate standard titration solution in moles per liter (mol/L);

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

M - copper ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) molar mass in grams per mole (g/mol) ($M = 249.7$);

1000 --- conversion factor.

The experimental results are based on the arithmetic mean of the parallel measurement results. The absolute difference between the two independent determinations obtained under repeatability conditions the value is not greater than 0.3%.

Determination of hydrogen sulfide non - precipitate A.5.1 Methodological Summary

Hydrogen sulfide precipitated in the sample of copper plasma, non-precipitated ions remain in the solution, filtered filtrate by evaporation, after burning determination of sulfur Hydrogen does not precipitate the content.

A.5.2 Reagents and materials A.5.2.1 Hydrogen Sulfide.

WARNING. Hydrogen sulfide is a toxic gas and the operation should be carried out in a fume hood.

A.5.2.2 Sulfuric acid solution. 1 100.

A.5.3 Instruments and equipment A.5.3.1 porcelain evaporative dish (or porcelain crucible). capacity of 100mL.

A.5.3.2 High temperature furnace. can control the temperature of $800\text{ }^{\circ}\text{C} \pm 25\text{ }^{\circ}\text{C}$.

A.5.3.3 Hydrogen Sulfide Absorber.

The hydrogen sulphide absorption device is shown in Figure A.1. A saturated copper sulfate solution is used in the tail gas absorption bottle.

Figure A.1 Hydrogen Sulfide Absorption Device

A.5.4 Analysis steps Weigh the sample of $5.00\text{ g} \pm 0.01\text{ g}$, placed in a sample solution absorption flask (250 mL Erlenmeyer flask), add.200 mL of sulfuric acid solution, to $70\text{ }^{\circ}\text{C}$, according to the hydrogen sulphide absorption device diagram to connect the sample solution absorption bottle and tail gas absorption bottle, the first leak test, Liquid hydrogen sulfide gas into the liquid until the copper ion precipitation completely. The precipitated sample solution was transferred to a 250 mL volumetric flask and diluted with water Release to the scale, shake. Placed to precipitate sinking, with a slow qualitative filter paper dry filter, discard the initial filtrate 10mL. Remove.200 mL with pipette the filtrate is transferred to a 250 mL beaker, covered with a surface dish, placed in a pad of asbestos net on a small furnace to heat the solution (the heating process should be adjusted at any time the whole furnace temperature, to prevent the solution splash). Evaporated to about 20 mL of solution, and the solution was transferred to a temperature of $800\text{ }^{\circ}\text{C} \pm 25\text{ }^{\circ}\text{C}$ until the mass was constant (Or porcelain crucible), placed in a water bath heated to dry, and then in the electric furnace with a fire heated to sulfuric acid smoke exhausted, transferred to high temperature Furnace, at $800\text{ }^{\circ}\text{C} \pm 25\text{ }^{\circ}\text{C}$ under the conditions of burning to a constant quality. After cooling, weigh. Retention residue A was used for the determination of iron (A.6.2).

A.5.5 Calculation of results Hydrogen sulfide does not precipitate the mass fraction w_2 , calculated according to formula (A.2).

$m_1 - m_0$

$m \times (200/250) \times 100\%$ (A.2) where.