



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

GB 1903.8-2015

**National Food Safety Standard -- Food Nutrition Enhancer --
Copper Gluconate**

食品安全国家标准 食品营养强化剂 葡萄糖酸铜

(English Translation)

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1 Scope

This standard applies to the copper gluconate or gluconate and copper oxidation reaction, crystallization derived food nutrition fortifier glucose Acid Copper Products; The product can also be glucose to gluconic acid after electrolysis with copper carbonate and made.

2 Molecular formula, relative molecular mass and structural formula

Formula 2.1

$C_{12}H_{22}CuO_{14}$

2.3 Relative molecular mass

453.84 (according to 2011 international relative atomic mass)

3.1 Sensory requirements

Sensory requirements shall comply with the requirements of Table 1.

Table 1 Sensory requirements

Project requires test methods Light blue color State fine powder Take the right amount of sample is placed in a clean, dry white porcelain plate , Under natural light, observe its color and status

3.2 Physical and Chemical Indicators

Physical and chemical indicators should be consistent with the provisions of Table 2.

Table 2. Physical and chemical indicators

Item Index Test Method Copper gluconate (to $C_{12}H_{22}CuO_{14}$ dollars), w /% 98.0 ~ 102.0

Appendix A A.4 Reducing substances (with D-C₆H₁₂O₆ meter), w /% ≤ 1.0 A.5 in Appendix A Total arsenic (As)/(mg/kg) ≤ 3.0 Appendix A A.6 Lead (Pb)/(mg/kg) ≤ 2.0 Appendix A A.7 Chloride (Cl dollars), w /% ≤ 0.07 Appendix A A.8 Sulfate (SO₄ dollars), w /% ≤ 0.05 A.9 in Appendix A Appendix A Testing method A.1 Safety Tips Reagents The standard test methods used for toxic or corrosive in accordance with the relevant provisions need to be careful when using the operation. If the Splashed on the skin should immediately wash with water, severe cases should be treated immediately. When using a volatile acid, it should be carried out in a fume hood.

A.2 General Provisions Unless otherwise indicated in the analysis using only confirm three water as analytical reagent and GB/T 6682 stipulated. Test Methods Standard titration solution, impurities measured by standard solution, preparations and products, did not indicate when the other requirements, according to GB/T 601, GB/T 602, the provisions of the preparation of GB/T 603's. The solution in a solvent which does not indicate by when formulated, refers to an aqueous solution.

A.3 Identification Test A.3.1 Reagents and materials A.3.1.1 hydrochloric acid.

A.3.1.2 aqueous ammonia solution (6mol/L). Take a concentration of 28% ammonium hydroxide solution 400mL, diluted with water to 1000mL. The ammonia solution Content of 9.5% to 10.5%.

A.3.1.3 potassium ferrocyanide solution (0.1g/mL). Weigh 1g potassium ferrocyanide [K₄Fe(CN)₆ · 3H₂O], was dissolved in 10mL water in. The solution is using now.

A.3.1.4 acetic acid.

A.3.1.5 phenylhydrazine. distilled before use.

A.3.1.6 iron. Bright not rust.

A.3.2 Identification method A.3.2.1 copper ions (Cu²⁺) Identification A.3.2.1.1 sample solution Weigh 5.0g sample was dissolved in water and dilute to 100mL.

A.3.2.1.2 analysis step A.3.2.1.2.1 proper amount of sample solution, adding a small amount of hydrochloric acid, into the piece of iron, iron sheet surface quickly form a red metallic copper film.

A.3.2.1.2.2 proper amount of sample solution, the addition of excess ammonia solution, blue precipitate is generated, and then the precipitate was dissolved, the solution turns dark blue.

A.3.2.1.2.3 take appropriate sample solution was added a solution of potassium ferrocyanide generated red-brown precipitate, the precipitate is insoluble in dilute nitric acid.

A.3.2.2 Identification gluconate A.3.2.2.1 Method summary Samples in acetic acid medium, and phenylhydrazine were hot, a yellow crystalline glucose acid phenylhydrazine.

A.3.2.2.2 Test Procedure Weigh copper gluconate sample 1.0g, dissolved in warm water, set the volume to 10mL, as the test solution. Take the test solution 5mL, was added 0.7mL 1mL of glacial acetic acid and phenylhydrazine, in a water bath heated 30min, to room temperature, the inner wall of the tube with a glass rod friction, the precipitated yellow crystals.

A.3.2.3 Infrared Absorption Spectroscopy Using potassium bromide tablet method, tested in accordance with the provisions of GB/T 6040, and infrared spectra of the sample should be the control spectrum (spectrum control See Appendix B) consistent.

A.4 copper gluconate (to $C_{12}H_{22}CuO_{14}$ meter) measurement A.4.1 Method summary Under acidic conditions, the sample was added an excess of potassium iodide and cupric RQ, using starch as indicator, with sodium thiosulfate Precipitation titration standard solution of iodine.

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

A.4.2.2 acetic acid.

A.4.2.3 ammonium thiocyanate.

A.4.2.4 sodium thiosulfate standard solution. $c(Na_2S_2O_3) = 0.1mol/L$.

A.4.2.5 starch indicator solution. 10g/L.

A.4.3 Analysis step

Weigh about 1.5g sample in 250mL Erlenmeyer flask (accurate to 0.001g), was added 100mL of water, and dissolved. Add 2mL of acetic acid and 5g potassium iodide and mix thoroughly. Titrated with standard sodium thiosulfate solution to a pale yellow. Add 2.0g of ammonium thiocyanate, mix, plus 3mL Starch indicator solution and continue titration to white. While doing the blank test.

A.4.4 Calculation Results Copper gluconate mass fraction w_1 , expressed in%, according to equation (A.1) Calculated.

$(V-V_0) \times c \times M$

$m_1 \times 1000 \times$

100% (A.1)

Where.

Volume V --- titrate the sample solution consumption of sodium thiosulfate standard solution, in milliliters (mL);

Volume V_0 blank solution --- titration sample consumption of sodium thiosulfate standard solution, in milliliters (mL);

c --- sodium thiosulfate standard solution concentration, in units of moles per liter (mol/L);

Molar mass M --- copper gluconate, in units of grams per mole (g/mol), [M ($C_{12}H_{22}CuO_{14}$) = 453.84];

M_1 --- the quality of the sample, in grams (g);

1000 --- conversion factor.

Independent determination results of two test results obtained under the repeatability condition of absolute difference is not more than 0.2%.

A.5 Determination of reducing substances (with D-C₆H₁₂O₆ basis) A.5.1 Method summary

Under boiling conditions, reducing substances and excess copper gluconate or alkaline copper citrate solution produced by the reaction equivalent amount of cuprous oxide the precipitate was cooled. Hydrochloric acid was added to dissolve the cuprous precipitate was accurately added in excess iodine standard solution. Copper ions and a considerable amount of iodine occurs Redox reaction, excess iodine with sodium thiosulfate standard solution titration. By calculating the iodine consumption of copper ions, to calculate the sample Content of reducing substances.

A.5.2 Reagents and materials A.5.2.1 alkaline copper citrate solution Weigh 173g sodium citrate ($C_6H_5Na_3O_7 \cdot 2H_2O$) and 117g of sodium carbonate ($Na_2CO_3 \cdot H_2O$), adding about 700mL water plus Heat to dissolve, filtered through a filter paper, if necessary. Weigh 17.3g of copper sulfate ($CuSO_4 \cdot 5H_2O$) in another beaker, dissolved in water with about 100mL Was slowly added to the solution, was added during stirring constantly cooled, add water to 1000mL, and mix.

A.5.2.2 iodine standard solution. $c(I_2) = 0.1\text{mol/L}$.

A.5.2.3 sodium thiosulfate standard solution. $c(Na_2S_2O_3) = 0.1\text{mol/L}$.

A.5.2.4 starch indicator solution. 10g/L.

A.5.2.5 acetic acid solution. 0.6mol/L.

A.5.2.6 hydrochloric acid solution. 3mol/L.

A.5.3 Analysis step

Weigh about 1g sample in 250mL iodine flask (accurate to 0.001g), was dissolved in 10mL water. Alkaline Ning added 25.0mL Citric acid copper solution (A.5.2.1), in a small bottle covered with a watch glass and accurate micro-boiling 5min, rapidly cooled to room temperature. In acetic acid was added 25.0mL Solution (A.5.2.5), shake and accurately added 10.0mL of iodine standard solution (A.5.2.2), stopper tightly, shake, place 10min. Added 10mL Hydrochloric acid solution, then add starch indicator solution 3.0mL (A.5.2.4), immediately with sodium thiosulfate standard solution (A.5.2.3) titrated to the end point.

A.5.4 Calculation Results Reducing substances (with D-C₆H₁₂O₆ meter) mass fraction w_2 ,