



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

GB 5009.13-2017

**National food safety standard - Determination of copper in
foods**

食品安全国家标准 食品中铜的测定

(English Translation)

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Foreword

This standard replaces GB/T 5009.13-2003 "Determination of copper in food", GB 5413.21-2010 "National food safety standard - Determination of calcium, iron, zinc, sodium, potassium, magnesium, copper and manganese in foods for infants and young children, milk and milk products", GB/T 23375-2009 "Determination of copper, iron, zinc, calcium, magnesium and phosphorus content in vegetables and derived products", GB/T 9695.22-2009 "Meat and meat products - Determination of copper content", GB/T 14609-2008 "Inspection of grain and oils - Determination of copper, iron, manganese, zinc, calcium, magnesium in cereals and derived products by atomic absorption and flame spectrophotometry", GB/T 18932.12-2002 "Method for the determination of potassium,

sodium, calcium, magnesium, zinc, iron, copper, manganese, chromium, lead, cadmium contents in honey - Atomic absorption spectrometry", NY/T 1201-2006 "Determination of copper iron and zinc content in vegetables and derived products".

As compared with GB/T 5009.13-2003, the main changes of this standard are as follows.

- CHANGE the standard name into "National food safety standard -Determination of copper in foods";
- In the pretreatment method, ADD the wet digestion, pressure tank digestion, and microwave digestion;
- RETAIN the graphite furnace atomic absorption spectrometry method as

1 Method, using the ammonium dihydrogen phosphate-palladium nitrate

solution as a matrix modifier; RETAIN the flame atomic absorption spectrometry method as Method 2; DELETE the diethyldithiocarbamate colorimetric method;

- ADD the inductively coupled plasma mass spectrometry method as Method 3;
- ADD the inductively coupled plasma emission spectrometry method as Method 4;
- ADD the microwave digestion temperature rising program, graphite furnace atomic absorption spectrometry, flame atomic absorption spectrometry instrument reference conditions as the appendixes.

National food safety standard -Determination of copper in foods

1 Scope

This standard specifies the determination of copper content in food, by graphite furnace and flame atomic absorption spectrometry, inductively coupled plasma mass spectrometry, inductively coupled plasma-atomic emission spectrometry.

This standard applies to the determination of copper in all types of foods.

Method 1 -- Graphite furnace atomic absorption spectrometry

2 Principle

After digestion, the specimen is atomized in graphite furnace AND the absorbance is measured at 324.8 nm. In a certain concentration range, the copper absorbance value is proportional to the copper content, which is compared with the standard series for quantitative.

3 Reagents and materials

Unless otherwise indicated, the reagents used in this method are excellent pure AND the water is the grade 2 water as specified in GB/T 6682.

3.1 Reagents

3.1.1

Nitric acid (HNO₃).

3.2.1 Nitric acid solution (5 + 95). MEASURE 50 mL of nitric acid; slowly ADD it into 950 mL of water; MIX it uniformly.

3.2.2 Nitric acid solution (1 + 1). MEASURE 250 mL of nitric acid; slowly ADD it into 250 mL of water; MIX it uniformly.

3.3 Standard substance

Copper sulfate pentahydrate (CuSO₄ · 5H₂O, CAS No.. 7758-99-8). purity > 99.99%, OR the copper standard solution of a certain concentration certified and awarded with the standard substance certificate by the state.

3.4.1 Standard copper stock solution (1000 mg/L). Accurately WEIGH 3.9289 g

(accurate to 0.0001 g) of copper sulfate pentahydrate; USE a small amount of nitric acid (1 + 1) to dissolve it; TRANSFER t into a 1000 mL volumetric flask;

ADD water to the mark; MIX it uniformly.

3.4.2 Copper standard intermediate solution (1.00 mg/L). Accurately PIPETTE

1.00 mL of copper standard stock solution (1000 mg/L) into a 1000 mL volumetric flask; ADD nitric acid solution (5 + 95) to the mark; MIX it uniformly.

4 Instruments and equipment

Note: All glassware and Teflon digestion inner tanks must be soaked in nitric acid (1 + 5) overnight; rinsed repeatedly with tap water; finally rinsed clean with water.

4.1 Atomic absorption spectrometer. Equipped with graphite furnace atomizer and copper hollow cathode lamp.

4.2 Analytical balance. Sensitivity of 0.1 mg and 1 mg.

4.3 Adjustable electric furnace.

4.6 Pressure digestion tank. Equipped with polytetrafluoroethylene digestion inner tank.

4.7 Constant temperature drying oven.

4.8 Muffle furnace.

5.1 Specimen preparation

Note: Specimen contamination shall be avoided during sampling and sample preparation.

5.2.1 Wet digestion

WEIGH 0.2 g ~ 3 g (accurate to 0.001 g) of solid specimen or accurately PIPETTE 0.500 mL ~ 5.00 mL of liquid specimen into the graduated digestion tube; ADD 10 mL of nitric acid and 0.5 mL of perchloric acid; MAKE it digested on the adjustable electric furnace (reference conditions. 120 °C / 0.5 h ~ 1 h;

5.2.3 Pressure tank digestion

WEIGH 0.2 g ~ 1 g (accurate to 0.001 g) of solid specimen or accurately PIPETTE 0.500 mL ~ 5.00 mL of liquid specimen into the digestion inner tank;

ADD 5 mL of nitric acid.

5.2.4 Dry ashing

Weigh 0.5 g ~ 5 g (accurate to 0.001 g) of solid specimen or accurately PIPETTE 0.500 mL ~ 10.0 mL of liquid specimen into a crucible; USE gentle fire to heat it to carbonize it to smokeless; TRANSFER it into a muffle furnace;

MAKE it subject to ashing at 550 °C for 3 h ~ 4 h.

5.3.1 Instrument reference conditions

Each instrument is adjusted to its optimal state based on its performance. The reference conditions are as shown in Appendix B.

5.3.3 Determination of specimen solution

Under the same test conditions as the determination of standard solutions, INJECT 10 µL of blank solution or sample solution and 5 µL of ammonium dihydrogen phosphate-palladium nitrate solution (the optimal injection volume may be determined in accordance with the instruments used), into the graphite furnace at the same time;