



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

GB 5009.182-2017

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

食品安全国家标准 食品中铝的测定

(English Translation)

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Foreword

For the determination method of aluminum, this standard replaces GB/T 5009.182-2003 "Determination of aluminum in flour products", GB/T 23374-

2009 "Determination of aluminium in foods - Inductively coupled plasma mass

spectrometry", GB/T 18932.11-2002 "Method for the determination of potassium, phosphorus, iron, calcium, zinc, aluminium, sodium, magnesium, boron, manganese, copper, barium, titanium, vanadium, nickel, cobalt, chromium contents in honey. Inductively coupled plasma atomic emission spectrometric method (ICP-AES)", SN/T 2208-2008 "Determination of sodium,

magnesium, aluminium, calcium, chromium, iron, nickel, copper, zinc, arsenic, strontium, molybdenum, cadmium, lead, mercury, selenium, in aquatic products

- Microwave digestion - ICP/MS method ".

As compared with GB/T 5009.182-2003, the main changes of this standard are as follows.

---The standard name is changed to "National food safety standard - Determination of aluminium in foods";

---Improve method I spectrophotometry;

---Add inductively coupled plasma mass spectrometry as method II;

---Add inductively coupled plasma emission spectrometry as method III;

---Add graphite furnace atomic absorption spectrometry as method IV.

National food safety standard -

Determination of aluminum in foods

1 Scope

This standard specifies some methods for determination of aluminum content in foods, such as spectrophotometry, inductively coupled plasma mass spectrometry, inductively coupled plasma emission spectrometry and graphite furnace atomic absorption spectrometry.

Method I in this standard applies to the detection of aluminum in foods containing aluminum-based food additives. Method II, method III and method IV are applicable to the detection of aluminum in foods.

Method I. Spectrophotometry

2 Principles

After the sample is treated, it is in ethylenediamine-HCl buffer solution (pH 6.7-7.0), with the existence of Triton X-100 and cetylpyridinium bromide (CPB), trivalence aluminum ion reacts with chrome azurol S to generate blue-green quaternary micelle.

3 Reagents and materials

Unless otherwise indicated, the reagents used in this method are analytical pure, the experimental water is the grade-3 water specified in GB/T 6682.

3.2.1 Hydrochloric acid solution (1+1). MEASURE 50 mL of hydrochloric acid; MIX it uniformly with 50 mL of water.

3.2.2 Sulfuric acid solution (1%). PIPETTE 1 mL of sulfuric acid; POUR slowly into 80 mL of water; USE water to dilute it to 100 ml after cooling; MIX it uniformly.

3.2.12 Ethylenediamine solution (1+2). MEASURE 10 mL of ethylenediamine; slowly POUR into 20 mL of water; MIX it uniformly.

3.2.13 Ethylenediamine-hydrochloric acid buffer solution (pH6.7~7.0).

MEASURE 100 mL of ethylenediamine; slowly POUR into 200 mL of water along glass rod; after cooling, ADD slowly 190 mL of hydrochloric acid along glass rod; MIX it uniformly; if pH > 7.0 or pH < 6.7, USE hydrochloric acid solution (1+1) or ethylenediamine solution (1+ 2) to adjust pH respectively.

3.2.14 Ascorbic acid solution (10 g/L). WEIGH 1 g of ascorbic acid; USE water to dilute it to 100 mL; MIX uniformly. Prepare it before use.

3.3 Standards

Aluminum standard solution. 1000 mg/L. Or aluminum standard solution with a certain concentration which is identified by national authentication and awarded a reference material certificate.

3.4.1 Aluminum standard intermediate solution (100 mg/L). Accurately

PIPETTE 1.00 mL of aluminum standard solution (1000 mg/L) into 10 mL volumetric flask; ADD nitric acid solution (5%) to dilute it to the mark; MIX it uniformly.

4 Instrument and equipment

Note: All glassware must be soaked in nitric acid solution (1+5) for more than 24h, washed repeatedly with tap water, finally rinsed with water. Dry it by airing before use.

5.1 Sample Preparation

In the process of sampling and sample preparation, pay attention not to contaminate the sample; avoid using aluminum-containing appliances.

5.2 Sample digestion

WEIGH 0.2 g ~ 3 g of sample (accurate to 0.001g) or accurately MOVE 0.500 mL ~ 5.00 mL of liquid sample into hard glass digestion tube or conical flask; ADD 10 mL of nitric acid and 0.5 mL of sulfuric acid; HEAT it on adjustable temperature-control electric furnace or hot plate, reference conditions.

5.3 Color reaction and colorimetric determination

Respectively PIPETTE 1.00 mL (V2) of sample digestive juice and blank solution; PLACE them into 25 mL plugged colorimetric tube; ADD water to 10 mL. In addition, TAKE seven 25 mL plugged colorimetric tubes; ADD respectively aluminum standard working solution 0 mL, 0.500 mL, 1.00 mL,

2.00 mL, 3.00 mL, 4.00 mL and 5.00 mL (in the series standard solution, the mass of aluminum is 0 µg, 0.500 µg, 1.00 µg, 2.00 µg, 3.00 µg, 4.00 µg, 5.00 µg respectively); ADD 1 mL of sulfuric acid solution (1%) in each tube successively; ADD water to 10 mL.

6 Analysis results expression

The aluminum content in the sample is calculated according to equation (1).

7 Precision

The absolute difference between two independent determinations obtained under repeatability conditions shall not exceed 10% of the arithmetic mean.