NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

GB 31604.49-2023

National food safety standard - Food contact materials and products - Determination of multi-elements and determination of multi-element migration

Issued on: September 6, 2023 **Implemented on: September 6, 2024**

Issued by: NHC; SAMR

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1 Scope

This Standard specifies the method for the determination of arsenic, cadmium, chromium and lead, and the determination of aluminum, arsenic, barium, cadmium, cobalt, chromium, copper, iron, lithium, manganese, molybdenum, nickel, lead, antimony, tin and zinc migration in food contact materials and products.

Part 1 is applicable to the determination of arsenic, cadmium, chromium and lead in food contact paper and cardboard materials and products, cork stoppers and bamboo and wood products.

Part 2 is applicable to the determination of aluminum, arsenic, barium, cadmium, cobalt, chromium, copper, iron, lithium, manganese, molybdenum, nickel, lead, antimony, tin and zinc migration in food contact plastic materials and products, food contact paints and coatings, food contact rubber materials and products, inks for food contact materials and products, adhesives for food contact materials and products, food contact paper and cardboard materials, pacifiers, enamel products, ceramic products, glass products, food contact plastic resins, food contact metal materials and products.

Part 1 - Determination of Arsenic, Cadmium, Chromium and Lead Method 1 Inductively Coupled Plasma Mass Spectrometry

2 Principle

After the specimen is crushed, use nitric acid for digestion. After the obtained solution is diluted with water to a constant volume, adopt an inductively coupled plasma mass spectrometer to conduct the determination. Take the specific mass number of the element (mass-to-charge ratio, m/z) for qualitative analysis and the external standard method for quantitative analysis.

3 Reagents and Materials

Unless it is otherwise specified, the reagents used in this Method are all excellent-grade pure, and the water is Grade-1 water specified in GB/T 6682.

3.2.1 Nitric acid solution (5 + 95). measure-take 50 mL of nitric acid, slowly add it to 950 mL

of water and evenly mix it.

3.2.2 Nitric acid solution (1 + 4). measure-take 1 L of nitric acid, slowly add it to 4 L of water

and evenly mix it.

3.3.1 Element standard solution (1,000 mg/L or 100 mg/L). for arsenic, cadmium, chromium

and lead, adopt single-element or multi-element standard stock solutions certified by the state and awarded a reference material certificate. It shall remain valid for 1 year.

3.3.2 Internal standard element solution (1,000 mg/L or 100 mg/L). for scandium, germanium, rhodium, indium, rhenium and bismuth, adopt single-element or multi-element standard stock solutions certified by the state and awarded a reference material certificate. It shall remain valid for 2 years.

3.4.1 Mixed standard working solution. accurately draw an appropriate amount of single-

element or multi-element mixed standard stock solution, use nitric acid solution (5 + 95) to dilute it step by step to prepare a mixed standard series solution. The concentration of each element is shown in Table A.1 in Appendix A. After the mixed standard series solution is prepared, transfer it to a brown glass container and store it away from light at room temperature.

It shall remain valid for 1 month.

NOTE. the concentration and range of the element in the standard series solution can be appropriately adjusted in accordance with the sensitivity and linear range of the instrument, and the actual content of each element in the specimen solution.

4 Instruments and Equipment

NOTE. all glassware and plasticware need to be soaked in nitric acid solution (1 + 4) overnight, rinsed with water and reserved for later use.

4.3 Microwave digestion instrument. equipped with a polytetrafluoroethylene digestion inner

tank.

5.1 Specimen Preparation

Take an appropriate amount of sample, use an appropriate crushing equipment to cut or grind the sample into powder, and evenly mix it.

5.2.2.1 Preparation of specimen solution

Weigh-take 0.5 g (accurate to 0.1 mg) of the crushed specimen, place it in the polytetrafluoroethylene digestion inner tank, add 5 mL ~ 8 mL of nitric acid, cover it and leave it for 1 h. Seal the digestion inner tank in the stainless-steel outer tank, and place it in a constant-temperature drying oven for digestion (see Table B.1 in Appendix B for the reference conditions of digestion). After digestion, wait until the digestion tank has been completely cooled down before slowly opening the inner cover. Use a small amount of water to rinse the inner cover twice and put it in the digestion tank. Place the digestion tank on the temperature-controllable electric hot plate and heat it at about 140 ?C for 30 min, or place it in the ultrasonic cleaning machine for 5 min. Transfer all the digestion solution to a 25 mL or 50 mL volumetric flask, use water to reach a constant volume to the scale, evenly mix it and reserve it for later testing.

5.2.2.2 Blank test

Except that no specimen is added, proceed in accordance with 5.2.2.1 to obtain a blank test solution.

5.3.1 Instrument operating conditions

The reference working conditions of the instrument are shown in Table B.2 in Appendix B. The element reference analysis mode is shown in Table B.3 in Appendix B.

NOTE. for instruments that do not have a suitable interference elimination mode, it is necessary to adopt the interference correction equations to correct the determination

results. The interference correction equation for arsenic, cadmium and lead, etc. are shown in Table B.4 in Appendix B.

6 Expression of Analysis Results

The residual amount of the element to be determined in the specimen is calculated in accordance with Formula (1).

7 Precision

When the residual amount of each element in food contact materials and products is > 1.00 mg/kg, the absolute difference between the results of two independent determinations obtained under repeatability conditions shall not exceed 10% of the arithmetic mean. When 0.100 mg/kg < the residual amount of each element ? 1.00 mg/kg, the absolute difference between the results of two independent determinations obtained under repeatability conditions shall not exceed 15% of the arithmetic mean. When the residual amount of each element is ? 0.100 mg/kg, the absolute difference between the results of two independent determinations obtained under repeatability conditions shall not exceed 20% of the arithmetic mean.

8 Others

When the sampling size is 0.5 g and the constant volume is 50 mL, the detection limit and quantitation limit of each element are shown in Table 1.

9 Principle

After the specimen is crushed, use nitric acid for digestion. After the obtained solution is diluted with water to a constant volume, adopt an inductively coupled plasma optical emission spectrometer to conduct the determination. Take the wavelength of the element's characteristic spectral line for qualitative analysis and the external standard method for quantitative analysis.

Element

10.2.1 Nitric acid solution (5 + 95). measure-take 50 mL of nitric acid, slowly add it to 950 mL

of water and evenly mix it.

10.2.2 Nitric acid solution (1 + 4). measure-take 1 L of nitric acid, slowly add it to 4 L of water

and evenly mix it.