



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

GB 5009.305-2025

**National food safety standard - Determination of bisphenol A,
bisphenol F and bisphenol S in foods**

食品安全国家标准 食品中双酚A、双酚F和双酚S的测定

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1 Scope

GB 5009.305-2025 is the Chinese national food safety standard for determining bisphenol A, F and S in food by liquid chromatography-tandem mass spectrometry. Bisphenol A migrates into food from can linings, polycarbonate containers and thermal paper, and when it was restricted the industry substituted bisphenol F and S, which are structurally similar and turn out to be similarly active - so measuring only BPA now understates the exposure, and all three have to be determined together. The standard sets the principle, the reagents and materials, the instruments and equipment, the analytical procedure, the expression of results, the precision and the additional notes, with an annex giving the immunoaffinity column verification method. It applies to meat and meat products, milk and dairy products, aquatic products, cereals, eggs and vegetables, and takes effect on 16 September 2025.

This Standard specifies the liquid chromatography-tandem mass spectrometry method for the determination of bisphenol A, bisphenol F and bisphenol S in foods. This Standard is applicable to the determination of bisphenol A, bisphenol F and bisphenol S in meat and meat products, milk and dairy products, aquatic products, cereals, eggs, vegetables, fruits, beverages, infant formula foods and infant cereal complementary foods.

2 Principle

Bisphenol A, bisphenol F and bisphenol S in the specimen were extracted with acetonitrile or methanol-water solution, purified by immunoaffinity column, determined by liquid chromatography-tandem mass spectrometry and quantified by internal standard method.

3 Reagents and Materials

Unless otherwise specified, all reagents used in this method were analytically pure and water was Grade-1 water as specified in GB/T 6682.

3.1 Reagents

3.1.1 Acetonitrile (CH_3CN). Chromatographically pure.

3.1.2 Methanol (CH_3OH). Chromatographically pure.

3.1.3 Sodium chloride (NaCl).

3.1.4 Disodium hydrogen phosphate (Na_2HPO_4).

3.1.5 Potassium dihydrogen phosphate (KH_2PO_4).

3.1.6 Potassium chloride (KCl).

3.1.7 Hydrochloric acid (HCl). Guaranteed reagent.

3.2 Preparation of reagents

3.2.1 Hydrochloric acid solution (10+90). Pipette 10 mL of hydrochloric acid; add to 90 mL of water; and mix well.

3.2.2 Phosphate buffer solution (hereinafter referred to as PBS). Weigh

8.0 g of sodium chloride;

1.2 g of disodium hydrogen phosphate,

0.2 g of potassium dihydrogen phosphate, and

0.2 g of potassium chloride; dissolve in 900 mL of water; adjust the pH to $7.4 \pm$

0.1 with hydrochloric acid solution (10+90); and then dilute to 1,000 mL with water.

3.2.3 Methanol-water solution (80+20). Pipette 80 mL of methanol; add 20 mL of water; and mix well.

3.2.4 Methanol-water solution (40+60). Pipette 40 mL of methanol; add 60 mL of water; and mix well.

3.3 Standard sample

3.3.1 Bisphenol A standard sample (C₁₅H₁₆O₂, CAS. 80-05-7). Purity $\geq$ 99.0%; or a standard sample certified by the state and granted a standard substance certificate.

3.3.2 Bisphenol F standard sample (C₁₃H₁₂O₂, CAS. 620-92-8). Purity $\geq$ 99.0%, or a standard sample certified by the state and granted a standard substance certificate.

3.3.3 Bisphenol S standard sample (C₁₂H₁₀O₄S, CAS. 80-09-1). purity $\geq$ 99.0%, or a standard sample certified by the state and awarded a standard substance certificate.

3.3.4 ¹³C₁₂-Bisphenol A isotope internal standard (C₃¹³C₁₂H₁₆O₂, CAS. 263261-65-0). 100 mg/L, or a solid standard sample with a purity of $\geq$ 98.0%. 3.3.5 ¹³C₁₂-Bisphenol F isotope internal standard (C₃¹³C₁₂H₁₂O₂). 100 mg/L, or a solid standard sample with a purity of $\geq$ 98.0%. 3.3.6 ¹³C₁₂-bisphenol S isotope internal standard (C₃¹³C₁₂H₁₀O₄S). 100 mg/L, or solid standard sample with a purity of $\geq$ 98.0%.

3.4.1 Standard stock solution (100 mg/L). Accurately weigh 10 mg (accurate to

0.1 mg) of bisphenol A, bisphenol F and bisphenol S standard samples; dissolve them in methanol and dilute to 100 mL, respectively; and mix well. Transfer the solution to a brown glass reagent bottle and store it at -18 °C away from light. The validity period is 12 months.

3.4.2 Standard intermediate solution (1 mg/L). Accurately pipette

0.10 mL of the standard stock solution of bisphenol A, bisphenol F and bisphenol S, respectively, into 10 mL volumetric flasks; make constant volume to the scale with methanol; and mix well. Transfer the solution to a brown glass reagent bottle and store it at -18 °C away from light. The validity period is 6 months.

3.4.3 Standard mixed solution (bisphenol A and bisphenol F. 100 µg/L; bisphenol S. 10 µg/L). Accurately pipette

1.00 mL of each standard intermediate solution of bisphenol A and bisphenol F, respectively, and

0.10 mL of the standard intermediate solution of bisphenol S; place them in a 10 mL volumetric flask; make constant volume to the scale with methanol-water solution (40+60); and mix well. Prepare immediately before use.

3.4.4 Isotope internal standard intermediate solution (1 mg/L). Accurately pipette

0.10 mL of each $^{13}\text{C}_{12}$ -bisphenol A standard solution, $^{13}\text{C}_{12}$ -bisphenol F standard solution, and $^{13}\text{C}_{12}$ -bisphenol S standard solution; respectively place them in 10 mL volumetric flasks; make constant volume to the scale with methanol; and mix well. Transfer the solution to a brown glass reagent bottle and store it at $-18\text{ }^{\circ}\text{C}$ away from light. The validity period is 6 months.

3.4.5 Mixed isotope internal standard solution ($^{13}\text{C}_{12}$ -bisphenol A and $^{13}\text{C}_{12}$ -bisphenol F. $100\text{ }\mu\text{g/L}$; $^{13}\text{C}_{12}$ -bisphenol S. $10\text{ }\mu\text{g/L}$). Accurately pipette

1.00 mL of each $^{13}\text{C}_{12}$ -bisphenol A and $^{13}\text{C}_{12}$ -bisphenol F intermediate solution and

0.10 mL of $^{13}\text{C}_{12}$ -bisphenol S intermediate solution, respectively; place them in a 10 mL volumetric flask; make constant volume to the scale with methanol-water solution (40+60); and mix well. Prepare immediately before use.

3.4.6 Standard series working solution. Accurately and respectively pipette

0.10 mL,

0.20 mL,

0.50 mL,

0.80 mL,

2.00 mL of the standard mixed working solution into a 10 mL volumetric flask; add

0.50 mL of isotope internal standard mixed working solution; make constant volume to the scale with methanol-water solution (40+60); and mix well. The mass concentrations of bisphenol A and bisphenol F in the standard series working solutions are $1.00\text{ }\mu\text{g/L}$, $2.00\text{ }\mu\text{g/L}$, $5.00\text{ }\mu\text{g/L}$, $8.00\text{ }\mu\text{g/L}$, $10.0\text{ }\mu\text{g/L}$, and $20.0\text{ }\mu\text{g/L}$, respectively; the mass concentrations of bisphenol S are $0.100\text{ }\mu\text{g/L}$, $0.200\text{ }\mu\text{g/L}$, $0.500\text{ }\mu\text{g/L}$, $0.800\text{ }\mu\text{g/L}$, $1.00\text{ }\mu\text{g/L}$, and $2.00\text{ }\mu\text{g/L}$, respectively; the mass concentrations of $^{13}\text{C}_{12}$ -bisphenol A and $^{13}\text{C}_{12}$ -bisphenol F are $5.00\text{ }\mu\text{g/L}$; and the mass concentration of $^{13}\text{C}_{12}$ -bisphenol S is $0.500\text{ }\mu\text{g/L}$. Prepare immediately before use.

3.5 Materials

3.5.1 Bisphenol A, bisphenol F and bisphenol S composite immunoaffinity column. column capacity of each compound $\geq 200\text{ ng}$, column recovery $\geq 90\%$ (see Appendix A for verification method). NOTE. Different batches of immunoaffinity columns need to be quality verified before use.

3.5.2 Polypropylene centrifuge tubes. 2 mL and 50 mL.

3.5.3 Glass nitrogen blowpipe. 15 mL.