



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

GB 5009.307-2025

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

食品安全国家标准 食品中甲醛的测定

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1 Scope

GB 5009.307-2025 is the Chinese national food safety method for determining formaldehyde in food. Formaldehyde in food comes from two very different places, and the method has to serve both: it occurs naturally in some fish, shellfish and mushrooms as a breakdown product of trimethylamine oxide, and it is also used illegally as a preservative and whitener on seafood, tripe, noodles and bean products, which is one of the recurring adulteration cases in Chinese food enforcement. The standard describes the determination by high performance liquid chromatography after derivatisation and by spectrophotometry, and covers for each the principle, the reagents and materials, the apparatus, the preparation of the sample and the extraction, the analytical procedure, the calculation of results, the precision and the limit of quantification. It is a new standard, effective September 2025. For a food producer, an importer or an enforcement laboratory in China, this is the prescribed method.

This Standard specifies the determination method of formaldehyde in foods. The first method of this Standard is applicable to the determination of formaldehyde in beer; the second method is applicable to the determination of formaldehyde in foods. Method I Spectrophotometry

2 Principle

The sample is subjected to steam distillation; and the formaldehyde in the distillate reacts with acetylacetone to form a yellow substance with maximum absorption at 415 nm. Within a certain range, its absorbance value is proportional to the formaldehyde content.

3 Reagents and Materials

Unless otherwise specified, all the reagents used in this method are analytically pure; and the water is Grade 3 water specified in GB/T 6682.

3.1 Reagents

3.1.1 Glacial acetic acid ($C_2H_4O_2$).

3.1.2 Acetylacetone ($C_5H_8O_2$).

3.1.3 Ammonium acetate ($C_2H_7O_2N$).

3.1.4 Phosphoric acid (H_3PO_4).

3.1.5 Dimethyl silicone oil.

3.2.1 Acetylacetone solution. Weigh

25.0 g of ammonium acetate and dissolve it in 90 mL of water; then add

0.4 mL of acetylacetone and

3.0 mL of glacial acetic acid; dilute to 100 mL with water; mix well; and transfer to a brown reagent bottle. Prepare immediately before use.

3.2.2 Phosphoric acid solution (200 g/L). Weigh 20 g of phosphoric acid; dilute to 100 mL with water; mix well; and store at room temperature.

3.3 Standard sample Formaldehyde (CH₂O, CAS No.. 50-00-0) standard solution. 1,000 mg/L, or other standard samples certified by the state and awarded with standard substance certificates. NOTE. Formaldehyde standard solution can also be prepared and calibrated with 36% ~38% formaldehyde solution. For specific operations, see Appendix A.

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

1.00 mL of 1,000 mg/L formaldehyde standard solution; dilute with water and make constant volume to 10 mL; prepare a formaldehyde standard intermediate solution with a mass concentration of 100 mg/L; store at 2 °C ~8 °C away from light; and the validity period is 3 months.

3.4.2 Formaldehyde standard working solution (

1.0 mg/L). Accurately pipette

1.0 mL of 100 mg/L formaldehyde standard intermediate solution; dilute with water and make constant volume to 100 mL; prepare a formaldehyde standard working solution with a mass concentration of

1.0 mg/L. Prepare immediately before use.

3.4.3 Formaldehyde series standard working solution. Accurately pipette 0 mL,

0.50 mL,

1.0 mg/L formaldehyde standard working solution into 25 mL stoppered colorimetric tubes; add water to make constant volume to 10 mL; and prepare formaldehyde series standard working solutions with mass concentrations of 0 mg/L,

0.050 mg/L,

0.10 mg/L,

0.20 mg/L,

0.40 mg/L,

0.80 mg/L and

1.0 mg/L, respectively. Prepare immediately before use.

4 Instruments and Equipment

4.1 Spectrophotometer.

4.2 Steam distillation apparatus.

4.3 Water bath. controllable temperature $100\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$, accuracy $0.1\text{ }^{\circ}\text{C}$.

5 Analysis Procedures

5.1 Preparation of specimen Beer specimens shall be sealed and stored; before testing, mix the specimens evenly and remove the carbon dioxide in the specimens by filtering with medium-speed filter paper.

5.2.1 Distillation Accurately pipette

25.00 mL of the specimen; place it in a 500 mL distillation flask; add 20 mL of phosphoric acid solution (200 g/L), 1 mL of dimethyl silicone oil, and 50 mL of water; and perform steam distillation. Pre-add 10 mL of water to a 250 mL receiving flask; insert the receiving tube below the liquid surface; and place it in an ice bath. When about 195 mL of distillate is collected; take it out. Place it at room temperature for 30 min; transfer it to a 200 mL volumetric flask; add water to the scale; shake it well and set aside.

5.2.2 Color development Accurately pipette

10.0 mL of the distillate prepared in

5.2.1 and place it in a 25 mL stoppered colorimetric tube. Add 1 mL of acetylacetone solution (3.2.1) to the stoppered colorimetric tube; cover the stopper; and mix well. Place the stoppered colorimetric tube in a boiling water bath for 5 min; take it out; and cool it to room temperature.

5.3 Blank test Except for not adding the specimen, all other procedures are carried out according to Procedure 5.2.

5.4 Drawing of standard curve According to the method of 5.2.2, treat the formaldehyde series standard working solution (3.4.3) and the specimen at the same time and in the same way. After cooling to room temperature, place it in a 1 cm colorimetric dish; adjust the zero point as per the zero point of the formaldehyde series standard working solution as a reference; and measure the absorbance value at 415 nm. Use the concentration of the series standard working solution as the horizontal axis and its absorbance value as the vertical axis to draw a standard curve.

5.5 Determination of specimen solution Place the solution obtained in

5.3 in a 1 cm colorimetric dish and measure the absorbance at 415 nm. If the sample result exceeds the standard linear range, dilute it with a blank specimen solution and then measure it again. NOTE. The obtained sample solution shall be measured within 1 h.