



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

GB 31604.31-2025

Replacing GB 31604.31-2016

**National food safety standard - Food contact materials and
articles - Determination of the residues of vinyl chloride,
1,1-dichloroethylene and 1,1-dichloroethane**

食品安全国家标准 食品接触材料及制品 氯乙烯、1,1-二氯乙烯和1,1-二氯乙烷的
残留量的测定

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and Quarantine of the People's Republic of China, National Health
Commission of the People's Republic of China**

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Foreword

This document was issued on 2 September 2025 by the the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China, National Health Commission of the People's Republic of China and takes effect on 2 March 2026.

It is a GB standard without the /T suffix: compliance is mandatory in China.

The document runs to 15 pages in translation. The identification, the dates, the table of contents and the clauses reproduced on this page are taken from the standard itself.

GB 31604.31-2025 National food safety standard - Food contact materials and products - Determination of residual and migration of vinyl chloride, 1,1- dichloroethylene and 1,1- dichloroethane English, Anglais, Englisch, Inglés, ???

Determination of Residue and Migration Levels of Vinyl Chloride, 1,1-Dichloroethylene, and 1,1-Dichloroethane in Food Contact Materials and Articles

Determination of Residue and Migration Levels of Vinyl Chloride, 1,1-Dichloroethylene, and 1,1-Dichloroethane in Food Contact Materials and Articles

It replaces GB 31604.31-2016, which is superseded.

1 Scope

GB 31604.31 is the Chinese national food safety method for residual vinyl chloride, 1,1-dichloroethylene and 1,1-dichloroethane in food contact materials. Vinyl chloride monomer is a confirmed human carcinogen, and what is measured here is what is left unreacted in the PVC or PVDC after polymerisation, held in the polymer and able to move into the food. The limits are among the lowest anywhere in food contact regulation, which makes the method demanding: the determination is by headspace gas chromatography, with the sample dissolved or dispersed and the monomer partitioned into the headspace under controlled conditions. The standard covers the principle, the reagents and materials, the apparatus, the preparation of the sample and of the standard solutions, the analytical

procedure, the calculation of results, the precision and the limit of quantification for each of the three substances. The 2025 edition replaces GB 31604.31-2016. For a PVC or PVDC film maker, a packer or a laboratory testing for the Chinese market, this is the prescribed method.

This standard specifies methods for determining the residual levels and migration of vinyl chloride, 1,1-dichloroethylene, and 1,1-dichloroethane in food contact materials and articles.

This standard applies to the determination of residues and migration levels of vinyl chloride, 1,1-dichloroethylene, and 1,1-dichloroethane in plastic, coating, adhesive, paper and paper product, and ink-based food contact materials and articles.

Part I Determination of Residual Levels of Vinyl Chloride, 1,1-Dichloroethylene, and 1,1-Dichloroethane

Method 1 Gas Chromatography

2 Principle

The sample is placed in a headspace vial, dissolved or thoroughly dispersed in N,N-dimethylacetamide, and heated to achieve gas-liquid equilibrium for the target components vinyl chloride, 1,1-dichloroethylene, and 1,1-dichloroethane. A quantitative volume of the headspace gas is injected into a gas chromatograph for separation. Detection is performed using an electron capture detector (ECD). Qualitative analysis is based on retention time, and quantitative analysis employs the external standard method using peak area.

3 Reagents and Materials

Unless otherwise specified, reagents used in this method are analytical grade. Water complies with Grade 1 water as defined by GB/T 6682.

3.1 Reagents

N,N-Dimethylacetamide: Purity > 99%.

3.2 Standards

3.2.1 Vinyl Chloride (C₂H₃Cl, CAS No.: 75-01-4): Standard solution certified by the national authority and issued with a Certificate of Analysis, concentration 1000 mg/L, in methanol solvent.

3.2.2 1,1-Dichloroethylene (C₂H₂Cl₂, CAS No.: 75-35-4): Purity ≥99.5%, or a standard material certified by the state and granted a Certificate of Analysis.

3.2.3 1,1-Dichloroethane (C₂H₄Cl₂, CAS No.: 75-34-3): Purity ≥99.5%, or a national

certified reference material with a certificate of analysis.

Note: All three substances above are highly volatile. Standard samples should be stored sealed in a refrigerator away from light. Once opened, ampoule-sealed standard samples must be used immediately and cannot be resealed for future use as standard material. Exercise personal protection when handling standard samples to avoid inhalation or skin contact.

3.3 Preparation of Standard Solutions

3.3.1 1,1-Dichloroethylene Standard Stock Solution (1000 mg/L): Accurately weigh 10 mg (to the nearest 0.1 mg) of 1,1-dichloroethylene standard material. Dissolve in N,N-dimethylacetamide and transfer to a 10 mL brown volumetric flask. Dilute to the mark and mix thoroughly. Transfer to a brown storage bottle. Store tightly sealed in a 4°C refrigerator protected from light. Shelf life: 3 months.

3.3.2 1,1-Dichloroethane Standard Stock Solution (1000 mg/L): Accurately weigh 10 mg (to the nearest 0.1 mg) of 1,1-dichloroethane standard material. Transfer to a 10 mL brown volumetric flask, dilute to the mark, and mix thoroughly. Transfer to a brown storage bottle, store tightly closed in a 4°C refrigerator protected from light, with a shelf life of 3 months.

3.3.3 Mixed Standard Intermediate Solution (10 mg/L): Accurately pipette 1.2 mL of vinyl chloride standard solution (3.2.1), 1,1-dichloroethylene standard stock solution (3.3.1), and 1,1-dichloroethane standard stock solution (3.3.2) into the same 10 mL brown volumetric flask. Add N, N,N-dimethylacetamide to the mark and mix thoroughly to obtain a mixed standard intermediate solution of vinyl chloride, 1,1-dichloroethylene, and 1,1-dichloroethane, each with a mass concentration of 10 mg/L. Transfer to brown storage bottles, store sealed in a 4°C refrigerator protected from light, with a shelf life of 1 month.

3.3.4 Standard Working Solution Series: Add 10.0 mL of N,N-dimethylacetamide to each of 5 headspace vials. Using a micropipette, slowly inject 50.0 uL, 75.0 uL, 100 uL, 150 uL, and 200 uL of the mixed standard intermediate solution into each vial. Immediately cap and seal. Mix thoroughly to obtain the mixed standard working solution of vinyl chloride, 1,1-dichloroethylene, and 1,1-dichloroethane in N,N-dimethylacetamide. with target concentrations of 0.050 mg/L, 0.075 mg/L, 0.10 mg/L, 0.15 mg/L, and 0.20 mg/L, respectively. Prepare and use immediately.

4 Instruments and Equipment

4.1 Gas chromatograph: Equipped with an electron capture detector (ECD).

4.2 Headspace autosampler.

4.3 Headspace vials: 20 mL capacity, with caps fitted with silicone or butyl rubber seals.

4.4 Micropipette: 200 uL capacity.

4.5 Electronic balance: Readings of 0.0001 g and 0.1 g.

5 Analytical Procedure

5.1 Preparation of Test and Blank Sample Solutions

5.1.1 Sample Solution Preparation

For plastic samples, paper, and paper products, cut or crush the sample to a maximum diameter of ≤ 0.5 cm. For coated, adhesive, or ink-based food contact materials and articles, scrape the dried coating, adhesive, or ink layer and grind it to a maximum diameter of ≤ 0.5 cm.

Weigh 1 g (accurate to 0.1 g) of the crushed sample into a headspace vial. Add 10.0 mL of N,N-dimethylacetamide, immediately cap and seal the vial, shake to dissolve or thoroughly disperse the sample, and place it in the headspace autosampler for analysis.

5.1.2 Preparation of Blank Sample Solution

Follow steps 5.1.1 except omit sample addition. Prepare the blank sample solution and place it in the headspace autosampler for analysis. Note: Due to the strong volatility of the target compound, avoid prolonged grinding in room-temperature equipment without refrigeration, which may cause sample heating and result in volatilization loss of the target compound.

5.2 Instrument Reference Conditions

5.2.1 Headspace reference conditions are as follows:

- a) Dosing loop: 1 mL or 3 mL;
- b) Equilibration temperature: 80 °C;
- c) Dosing loop temperature: 90 °C;
- d) Transfer line temperature: 100 °C;
- e) Equilibration time: 30 min;
- f) Pressurization time: 0.20 min;
- g) Injection port filling time: 0.10 min;
- h) Injection port equilibration time: 0.10 min;
- i) Injection time: 1.50 min.