NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB 1886.40-2025

Replacing GB 1886.40-2015

National Food Safety Standard - Food Additive - L-Malic Acid

食品安全国家标准 食品添加剂 L-苹果酸

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Foreword Foreword

This standard replaces GB 1886.40-2015, National Food Safety Standard - Food Additive - L-Malic Acid.

Compared with GB 1886.40-2015, the main changes in this standard are as follows: the scope has been changed; the physical and chemical indexes for moisture and for succinic acid have been added; the wording of the indexes for content and for total arsenic, and the limit for total arsenic, have been changed, and heavy metals has been deleted; the test methods for identification, content, clarity, fumaric acid, maleic acid, lead and total arsenic have been changed; a test method for succinic acid has been added; Annex A and Annex B have been changed and Annex C has been added.

1 Scope

This standard applies to the food additive L-malic acid obtained from fumaric acid or a fumarate as raw material by an enzyme engineering process, and to the food additive L-malic acid obtained from starch-based material or sugars as raw material by fermentation.

2 Chemical name, molecular formula, structural formula and relative molecular mass

2.1 Chemical name. L-hydroxysuccinic acid.

2.2 Molecular formula. $C_4H_6O_5$.

2.3 Structural formula. Printed in the standard as a drawing; the digitised text does not carry it.

2.4 Relative molecular mass. 134.09, based on the 2022 international relative atomic masses.

3 Technical requirements

3.1 Sensory requirements. The sensory requirements shall comply with Table 1. Table 1 fixes the colour as white, the state as crystals or crystalline powder, and the odour as a characteristic sour odour. The test method given against all three is the same: take a suitable amount of the sample, place it in a clean, dry white porcelain dish, observe its colour and state under natural light, and smell it.

3.2 Physical and chemical indexes. The physical and chemical indexes shall comply with Table 2. Table 2 fixes the following limits, each with the test method shown against it. Content, expressed as C4H6O5, mass fraction not less than 99.0 percent, by A.4 of Annex A. Specific rotation at 20 degrees Celsius with the sodium D line, from minus 1.6 to minus 2.6 degrees times square decimetre per kilogram, by A.5 of Annex A. Clarity: shall pass the test, by A.6 of Annex A. Moisture, mass fraction not more than 1.0 percent, by the Karl Fischer method of GB 5009.3. Residue on ignition, mass fraction not more than 0.10 percent, by A.7 of Annex A. Chloride, expressed as chloride ion, mass fraction not more than 0.004 percent, by A.8 of Annex A. Sulfate, expressed as sulfate ion, mass fraction not more than 0.02 percent, by A.9 of Annex A. Fumaric acid, mass fraction not more than 0.5 percent, by A.10 of Annex A. Maleic acid, mass fraction not more than 0.05 percent, by A.10 of Annex A. Succinic acid, mass fraction not more than 2.0 percent, by A.10 of Annex A. Lead, not more than 2.0 mg/kg, by GB 5009.12 or GB 5009.75. Total arsenic, expressed as As, not more than 1.0 mg/kg, by GB 5009.11 or GB 5009.76.

A.1 Warning

Some of the procedures laid down in the test methods may give rise to hazardous situations. The operator shall take appropriate safety and health measures.

A.2 General provisions

Unless other requirements are stated, the reagents used in this standard are analytically pure reagents.

Unless other requirements are stated, the standard volumetric solutions, the standard solutions for the determination of impurities, and the preparations and products used in the tests are prepared as laid down in GB/T 601, GB/T 602 and GB/T 603.

Where the solvent used to prepare a solution is not stated, grade three water as laid down in GB/T 6682 is meant.

A.3 Identification test

A.3.1 Reagents and materials. Ammonia solution: ammonia plus water, 2 plus 3. Sulfanilic acid solution: 10 g/L. Sodium nitrite solution: 200 g/L. Sodium hydroxide solution: 40 g/L.

A.3.2.1 Identification by colour formation with the ammonium salt. Weigh 0.5 g of the sample to the nearest 0.01 g into a 50 mL test tube and add 10 mL of water to dissolve it. Neutralise with the ammonia solution, add 1 mL of the sulfanilic acid solution and heat in a boiling water bath for 5 min. Add 5 mL of the sodium nitrite solution, heat in a boiling water bath for 3 min, then add 5 mL of the sodium hydroxide solution; observed from the top downwards, a red colour shall appear at once.

A.3.2.2 Identification by infrared absorption spectrum. Following GB/T 6040, carry out a qualitative analysis by the potassium bromide pellet method and record the infrared absorption spectrum. The infrared absorption spectrum of the sample shall agree in all substantial respects with Annex B.

A.4 Determination of content, expressed as C4H6O5

A.4.1 Outline of the method. With phenolphthalein as indicator, the sample solution is titrated with sodium hydroxide standard volumetric solution, and the total acid concentration of the sample solution, expressed as C4H6O5, is calculated from the volume of sodium hydroxide standard volumetric solution consumed.

A.4.2 Reagents and materials. Sodium hydroxide standard volumetric solution, concentration of NaOH 0.5 mol/L. Phenolphthalein indicator solution, 10 g/L.

A.4.3 Apparatus and equipment. Analytical balance, readability 0.0001 g.

A.4.4 Procedure. Weigh about 1.0 g of the sample to the nearest 0.0001 g, add 20 mL of carbon dioxide free water to dissolve it, add two drops of phenolphthalein indicator solution, and titrate with the sodium hydroxide standard volumetric solution to a faint pink that does not fade within 30 s, which is the end point. Carry out a blank test by the same procedure as for the sample.

A.4.5 Calculation of the result. The content, expressed as C4H6O5, is given as the mass fraction w1 in percent and is calculated by formula (A.1). In the formula: V1 is the volume of sodium hydroxide standard volumetric solution consumed by the sample solution, in millilitres; V0 is the volume of sodium hydroxide standard volumetric solution consumed by the blank solution, in millilitres; c is the concentration of the sodium hydroxide standard volumetric solution, in moles per litre; M is the molar mass of one half of L-malic acid, in grams per mole, taken as 67.04; m is the mass of the sample, in grams; and 1000 is a conversion factor. The test result is given as the arithmetic mean of parallel determinations, and the calculated result is kept to two decimal places.

A.4.6 Precision. The absolute difference between two independent results obtained under repeatability conditions shall not be greater than 0.2 percent.

A.5 Determination of specific rotation

A.5.1 Apparatus and equipment. Polarimeter, fitted with a sodium lamp giving the sodium D line at 589.3 nm, accuracy plus or minus 0.01 degrees. Analytical balance, readability 0.01 g.

A.5.2 Procedure. Weigh 4.25 g of the sample to the nearest 0.01 g, add 20 mL of water to dissolve it and make up to 50 mL; carry out the remaining steps as laid down in GB/T 613.

A.5.3 Calculation of the result. The specific rotation is given as alpha at 20 degrees Celsius with the sodium D line, expressed in degrees times square decimetre per kilogram, and is calculated by formula (A.2). In the formula: alpha is the optical rotation of the sample solution measured at 20 degrees Celsius, in degrees; l is the length of the polarimeter tube, in decimetres; and rho is the mass concentration of the active component of the sample in the solution, in grams per millilitre.

A.6 Determination of clarity

A.6.1 Reagents and materials. Nitric acid solution: nitric acid plus water, 1 plus 2. Silver nitrate solution: 20 g/L. Dextrin solution: 20 g/L. Hydrochloric acid standard solution, concentration of HCl 0.1 mol/L. Standard working solution containing 0.01 mg/mL of chlorine: accurately transfer 14.1 mL of the hydrochloric acid standard solution, dilute with water and make up to 50 mL; accurately measure 10.0 mL of that solution, dilute with water and make up to 1000 mL.

A.6.2 Apparatus and equipment. Nessler colour comparison tubes. Analytical balance, readability 0.01 g.

A.6.3.1 Preparation of the sample solution. Weigh about 1.0 g of the sample to the nearest 0.01 g into a Nessler tube, add 20 mL of water to dissolve it and shake well.

A.6.3.2 Preparation of the standard reference solution. Accurately measure 0.20 mL of the standard working solution, add water to 20 mL, add 1 mL of the nitric acid solution, 1 mL of the silver nitrate solution and 0.2 mL of the dextrin solution, shake well and leave in the dark for 15 min.

A.6.4 Judgement of the result. Observe axially and laterally, out of direct sunlight. If the turbidity of the sample solution is not greater than the turbidity of the standard reference solution, the test is passed.

A.7 Residue on ignition

Weigh 2.5 g of the sample to the nearest 0.0001 g and carry out the remaining steps as laid