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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 4548-2026

Replacing GB/T 4548-1995

Glassware - Hydrolytic resistance of the interior surfaces of glass containers - Determination by titration and classification

玻璃制品 玻璃容器内表面耐水侵蚀性能 用滴定法测定和分级

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. This document supersedes GB/T 4548-1995 "Test Methods and Classification of Water Erosion Resistance of Inner Surfaces of Glass Containers" and is consistent with GB/T 4548- Compared to.1995, aside from structural adjustments and editorial changes, the main technical changes are as follows:

---The scope has been changed (see Chapter 1, Chapter 1 of the.1995 edition);

---The terms and definitions for borosilicate glass, soda-lime glass, glass containers, full capacity, and filling capacity have been changed (see Chapter 3). (Sections 3.2, 3.4, 3.1, 3.6, and

3.7 of the.1995 edition)

---The terms and definitions for neutral glass, surface treatment, general glass bottles, small glass bottles, tubular bottles, and ampoules have been removed (see.1995). Versions 3.3, 3.5, 3.8, 3.9, and 3.10);

---The principle has been changed (see Chapter 4, Chapter 4 of the.1995 edition);

---The purity requirements for reagents have been increased (see 5.1);

---The requirements for distilled water, test water, and methyl red indicator solution have been revised (see 5.2, 5.3, 5.5; 5.6,

5.1 of the.1995 edition). 5.5);

---The requirements for autoclaves, burettes, narrow-mouth conical flasks, heating devices, and beakers have been changed (see 6.1~6.3, 6.5, 6.6). (Sections 6.1-6.3, 6.5, and

6.6 of the.1995 edition)

---The liquid contact plate in the instrument has been removed (see

6.7 in the.1995 edition);

5 Reagents

5.1 Purity Requirements Unless otherwise specified, reagents of analytical purity or higher should be used in the experiment.

5.2 Distilled water The following methods can be used to obtain it.

a) Meets the Class III water standard in GB/T 6682;

b) Prepared from water that meets drinking water quality standards by distillation, ion exchange, reverse osmosis or any other suitable method.

5.3 Test water The following methods were used to obtain the test water.

a) Meets the Class II standard of GB/T 6682.

b) Prepare test water from distilled water (5.2) by multiple distillations. The water obtained from multiple distillations should be placed in a quartz glass or borosilicate glass container. The solution was boiled in a glass flask made of acid salts for at least 15 minutes to remove carbon dioxide and then cooled. The product prepared by the above method... Water, whose conductivity at 25°C should not exceed 1 μS/cm, and should be neutral to methyl red indicator solution, i.e., neutral in 50 mL of solution. When

0.05 mL of methyl red indicator solution (5.5) is added to the water, it should turn an orange-red color corresponding to a pH of 5.5 ± 0.1 (not...). It is purplish-red or yellow.

5.4 Hydrochloric acid solution c(HCl) =

0.01 mol/L.

5.5 Methyl red indicator solution The solution was prepared by dissolving 25 mg of sodium methyl red (C15H14N3NaO2) in 100 mL of test water (5.3).

6 Instruments and Equipment

6.1 Autoclave The instrument should be able to withstand a pressure of at least 2.5 x 10^5 N/m^2 and be capable of undergoing heating cycles as specified in 9.3.It should be able to maintain... A temperature of (121±1)°C is provided, equipped with a thermometer or a calibrated thermocouple, a pressure gauge and an exhaust valve. If necessary, autoclaves and auxiliary equipment should be thoroughly cleaned with test water (5.3) before use.

6.2 Burette The burettes are available in capacities of 50 mL, 25 mL, 10 mL, or 2 mL,

meeting the requirements for Class A burettes in GB/T 12805-2011.The burettes... The capacity should be selected based on the expected consumption of hydrochloric acid solution (5.4).

6.3 Narrow-necked conical flask The flasks are available in 100mL and 250mL capacities, conforming to GB/T 22362.Each new narrow-mouth conical flask should be sterilized with distillation agent before use. Distilled water (5.2) is filled and pretreated in an autoclave according to the provisions of 9.3.

6.4 Single-mark pipette It should have an appropriate capacity and meet the requirements of Class A pipettes as described in GB/T 12808-2015.

6.5 Heating device A water bath or oven that can be heated to approximately 80°C.

6.6 Beaker It should have an appropriate capacity and comply with the requirements of GB/T 15724.Each new beaker should be filled with distilled water (5.2) before use. It is then filled and pretreated in an autoclave according to the provisions of 9.3.

7.Test Environment The ambient temperature was (22±2)°C and the relative humidity was (50±20)%.

8.1 Sample Quantity The number of glass containers to be tested depends on their capacity, the volume of extract required for a single titration, and the number of titrations needed. It should be done according to... Calculate according to the requirements given in Table 1.

8.2 Determination of filling capacity

8.2.1 Flat-bottomed glass containers Six samples (nominal capacity less than or equal to 100 mL) or three samples (nominal capacity greater than 100 mL) are randomly selected from the same batch of samples. Remove all dirt and packaging debris, and allow the dried sample to reach room temperature. Weigh each empty sample, accurate to 0.01g for samples with a nominal volume less than or equal to 30mL, and for samples with a nominal volume greater than 30mL. For a 30 mL sample, accurate to

0.1 g. Place the sample on a horizontal surface and fill the opening with distilled water (5.2), avoiding spillage and runoff. Add air bubbles. Weigh the filled samples, accurate to 0.01g for samples with a nominal volume less than or equal to 30mL, and for samples with a nominal volume greater than 30mL. For a 30 mL sample, accurate to

0.1 g, calculate the mass of water contained in the sample. Calculate the average of all sample results and express it in milliliters (1 g is equivalent to 1 mL), which is the average full capacity of the glass container. The value is 90% of the average full capacity, accurate to one decimal place. This value represents the filling capacity of a specific sample group.

8.2.2 Round-bottomed glass containers The filling capacity shall be determined as described in 8.2.1.When measuring the full capacity, the sample shall be vertically fixed in

an appropriate device.

8.2.3 Glass containers with spouts Determine the filling capacity as described in 8.2.1.When measuring the full capacity, first seal the mouth surface of the glass container with plastic tape.

9 Experimental Procedure

9.1 Test Duration The test should be completed within 8 hours.

9.2 Cleaning The cleaning process for each sample should be completed within 20 to 30 minutes. Remove any packaging debris or dirt that may have accumulated on any open samples during storage and transport. Before the test, fill each sample with distilled water (5.2) up to the rim and let it stand for (20±5) min. Empty the sample immediately before the test. Rinse twice with distilled water, then rinse with test water (5.3).

9.3 Filling and Heating Using an appropriate volumetric measuring device, fill each sample selected according to

8.1 and cleaned according to

9.2 with test water (5.3) to the specified volumetric level. Filling capacity. Each sample should be capped with an inert material. If an inverted beaker (6.6) is used as the cap, its dimensions should ensure that the bottom of the beaker is tightly sealed. Apply the sample to the edge. For samples with a volume of 2 mL or less, where the test water cannot be fully retained during autoclaving, an appropriate method can be used to seal them. Sealing. For example, a sealing plug made of inert material, secured with a clamping device. Place the sample on the rack of the autoclave (6.1), ensuring the sample is above the water level in the autoclave. Carefully close the autoclave door or lid, but keep the exhaust valve open. Heat the autoclave for 20-30 minutes to allow a large volume of... Steam escapes from the exhaust port and remains in this state for about 10 minutes. Close the exhaust valve and raise the temperature to 121°C within 20 to 22 minutes. From the point of reaching this temperature, maintain it at (121±1)°C for (60±1) min. Then, cool the temperature to 100°C over a period of 40 to 44 min. Exhaust gas at the rear to prevent the formation of a vacuum. Note

1.Experience shows that the heating rate to 121°C, the holding temperature (121±1)°C, and the cooling rate to 100°C are all critical. Deviations from the specified conditions... The same conditions may produce different results, or even render those results invalid. Remove the sample safely from the autoclave and cool it to room temperature within 30 minutes. Begin titration after cooling. Note

2.Extra care should be taken when cooling, as a temperature difference greater than 40°C may cause the glass to crack due to thermal shock.

9.4 Analysis of Extract Titrate within 1 hour of removing the container from the autoclave.