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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 13217.4-2020

Replacing GB/T 13217.4-2008

Test method for viscosity of ink

油墨黏度检验方法

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1 Scope

GB/T 13217.4-2020 is the Chinese national standard on test method for viscosity of ink, in the field of paint and colour industries. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 19 November 2020 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 June 2021. Classification: ICS 87.080, CCS Y44. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This standard specifies the testing methods for ink viscosity, including the coated No.4 cup viscometer method, the Zahn cup viscometer method, the coaxial cylindrical rotary viscometer method, the cone-plate viscometer method, the falling stick viscometer method, the parallel plate viscometer method. This standard applies to inks whose viscosity ranges from

0.001 Pa·s to 200 Pa·s.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 1723 Determination of viscosity of coatings

GB/T 3186 Paints varnishes and raw materials for paints and varnishes - Sampling

GB/T 9751.1 Paints and varnishes - Determination of viscosity using rotary viscometers - Part1: Cone-and-plate viscometer operated at a high rate of shear

GB/T 10247 Methods of viscosity measurement

GB/T 14624.3 Test method for fluidity of offset ink

GB/T 22770 Graphic technology - Determination of rheological properties of paste inks and vehicles by the falling rod viscometer ASTM D4212 Standard test method for viscosity by dip-type viscosity cups

3 Viscometer method by coated No.4 cup

3.1 Principle For a certain amount of ink specimen, at a certain temperature, the time it takes

4 Viscometer method by Zahn cup

4.1 Principle For a certain amount of ink specimen, at a certain temperature, the time it takes to flow out of a hole with a specified diameter is the viscosity of the ink specimen, expressed in s/Zahn cup number.

4.2 Scope of application It is suitable for testing liquid inks.

4.3 Tools and materials

4.3.1 Zahn cup viscometer: It is in accordance with ASTM D4212; the measurement range shall be less than 80 s.

4.3.2 Thermometer: The temperature range is 0 °C ~ 50 °C; the graduation value is 0.1 °C.

4.3.3 Scrubbing solvent: Different system liquid inks use the same series of special solvents.

4.4 Testing conditions The testing shall be carried out under constant ambient temperature

(23 ± 2) °C.

4.5 Testing steps

4.5.1 Select a representative specimen to be tested according to the provisions of GB/T 3186; wipe the inner wall of the viscosity cup and the leaking nozzle clean; hold the viscosity cup horizontally; use finger to block the leaking nozzle; pour the specimen which was stir evenly and adjusted to the temperature of (25 ± 0.2) °C into the viscosity cup, until it is flush with the edge of the viscosity cup; use glass rod to scrape off the air bubbles; reset the stopwatch to zero.

4.5.2 Release the finger and turn on the stopwatch at the same time. When the specimen flow is interrupted and the first drop appears, stop timekeeping. At this time, the time indicated by the stopwatch is the viscosity of the ink specimen.

4.6 Test results The test shall be carried out twice in parallel; the difference between the measured value and the average of the two measurements shall be less than 5%, the average of the two test results is the viscosity of the ink specimen. During the test, select the appropriate Zahn cup number, to facilitate the shortened to 10 minutes), record the data when the reading on the instrument is stable. Test again and record the data.

5.1.6 Test results Check the two test results; the difference between the measured value and the average of the two measurements shall be less than 5%, then the average of the two test results is the viscosity of the ink specimen. During the test, select the appropriate rotor or speed to accurately test the viscosity of the ink specimen.

5.2 Cone-plate viscometer method

5.2.1 Principle Cone-plate viscometer is a kind of rotary viscometer. The tested specimen is between the two plates; the cone-plate is driven to rotate due to the intermolecular friction. The greater the friction, the greater the viscosity of the specimen. The unit is expressed in cP (1 cP = 10-

5.2.2 Scope of application It is suitable for testing pasty inks.

5.2.3 Tools and materials

5.2.3.1 Cone-plate viscometer: It is in accordance with GB/T 9751.1; the measuring range is

0.001 Pa·s ~ 200 Pa·s.

5.2.3.2 Thermometer: The temperature range is 0 °C ~ 50 °C; the graduation value is 0.1 °C.

5.2.3.3 Scrubbing solvent: Liquid inks of different systems use the same special solvents.

5.2.4 Testing conditions The testing shall be carried out under constant ambient temperature (23 ± 2) °C.

5.2.5 Testing procedure

5.2.5.1 Check whether the instrument is clean before measurement; turn on the power switch; perform preheating and calibration.

5.2.5.2 Set the instrument at constant temperature (25 ± 0.2) °C; set the preheating and test time; select a suitable rotor.

5.2.5.3 Select a representative specimen to be tested according to the

6.5.1 Select a representative specimen to be tested according to the provisions of GB/T 3186; use an ink mixer to mix about 5 g of the specimen thoroughly; adjust it to the test temperature of (25 ± 0.2) °C; the specimen shall be uniform and without any rough particles. The selection of the load weight shall refer to the viscosity of the specimen; the maximum load weight shall generally be such that the fall time is within the range of 4 s ~ 10 s. The amount of the specimen shall be enough to fill the gap between the falling stick and the pores of the ring; meanwhile it shall be smeared on the lower part of the stick. Before starting the test, rotate the falling stick to distribute the specimen evenly. Use the maximum load to carry out a test. At this time, the falling stick and the periphery of pores are all wetted by the specimen.

6.5.2 Insert the falling stick into the hole of the ring to the support piece and make it stand still. Select a series of load weights for testing, the longest falling time is not more than 60 s; after each operation, use an ink mixer to scrap off the specimen on the falling stick; recoat it on the lower part of the stick. No other liquid shall be added during the test. The temperature of the specimen shall be checked before and after the test.

6.5.3 In accordance with the operation steps of 6.5.2, repeat the test three times; then record the data.

6.5.4 After the test is completed, the instrument shall be cleaned immediately by the use of a lint-free cloth and a suitable solvent.

6.6 Calculation method

6.6.1 Shear stress Shear stress is the force acting on a unit area and parallel to the acting surface; the unit is Pa. For the falling stick viscometer, the shear stress is proportional to the total amount of the stick and the applied load, which is calculated according to formula (1): Where: sigma - Shear stress, in Pascal (Pa); W - The total weight of the stick and the applied load, in Newton (N); A - Apparent shearing area, in square meters (m2); L - The falling distance of the falling stick (the distance between the start point and the end point of the timekeeping), in meters (m).