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

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**Anti-counterfeiting printing ink - Part 5: Pressure sensitive
anti-counterfeiting printing ink**

防伪油墨 第5部分:压敏防伪油墨

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3 Terms and definitions

3.1 Pressure sensitive anti-counterfeiting printing ink: an ink that produces a colour change under the action of pressure or friction.

3.2 Reference sample: a sample agreed between supplier and purchaser and used to compare the quality of the pressure sensitive anti-counterfeiting printing ink defined in 3.1.

3.3 Test sample: a sample of the pressure sensitive anti-counterfeiting printing ink defined in 3.1 that is submitted to the test.

3.4 Colourless pressure sensitive anti-counterfeiting printing ink: a pressure sensitive anti-counterfeiting printing ink whose print appears colourless, or of only a very pale colour, under the standard light source.

3.5 Colored pressure sensitive anti-counterfeiting printing ink: a pressure sensitive anti-counterfeiting printing ink whose print has a distinct colour under the standard light

source.

4 Classification

4.1 By the initial colour of the print under the standard light source, the inks are divided into colourless and coloured pressure sensitive anti-counterfeiting printing inks.

4.2 By the way the colour of the print changes, they are divided into reversible and irreversible pressure sensitive anti-counterfeiting printing inks. Note: at room temperature, whether the ink is reversible is judged by whether the print returns to its initial colour once the sensitizing condition has gone.

5 Requirements

5.1 Physical indicators. The physical indicators of the ink shall meet Table 1, which sets the requirements against three columns of ink type: offset (letterpress) ink, flexographic (gravure) ink and screen ink. The appearance colour of a colourless ink shall match the reference sample in all three columns; for a coloured ink the colour difference ΔE^*_{ab} shall be not greater than 2 in all three columns. The tinting strength shall be 95 % to 105 % in all three columns. The fineness of grind shall be not greater than 20 μm for offset ink and not greater than 35 μm for flexographic ink and is not required for screen ink. The flow shall be 25 mm to 43 mm for offset ink and is not required for the other two. The tack shall be 3 to 13 for offset ink and is not required for the other two. The viscosity by number 4 flow cup shall be 25 s to 70 s for flexographic ink and is not required for the other two; the viscosity by rotational viscometer shall be 2 000 mPa.s to 6 000 mPa.s for screen ink and is not required for the other two. The setting shall be 25 mm to 50 mm for flexographic ink and is not required for the other two. The adhesion shall be not less than 90 % for flexographic ink and for screen ink and is not required for offset ink. A note states that ΔE^*_{ab} is the colour difference between the test sample and the reference sample measured under the same test conditions.

5.2.1 Anti-counterfeiting identification feature. The anti-counterfeiting identification feature of the ink shall be that the print changes colour as soon as it is pressed or rubbed with a hard object or tool.

5.2.2 Resistance indicators. The resistance indicators of the ink cover resistance to hot water, to petrol, to ethanol, to light, to alkali, to acid and to heat, and the requirement is that the colour change feature of the test sample of the pressure sensitive ink is still present after the resistance tests of 6.3.

6.1 Test methods for the physical indicators

6.1.1 Appearance colour. The instruments and materials are prepared as laid down in clause 4 of GB/T 13217.1-2020. The test runs as follows: a) one reference sample and

three test samples are prepared by the method of 6.1 of GB/T 13217.1-2020; b) the instrument is calibrated, used and its results calculated as laid down in GB/T 19437; c) the colour values of the reference sample, namely the lightness L^* , the green to red component a^* and the blue to yellow component b^* , are measured as the colour standard, and three measuring points are chosen on the test sample that are free of print-through interference and of the same colour density as the measuring point of the reference sample, within 5 % difference of colour density; the three points are measured separately, the colour difference ΔE^*_{ab} is recorded and the arithmetic mean of the three points taken.

6.1.2 to 6.1.8 The other physical indicators are tested by reference to other standards: tinting strength to GB/T 13217.1-2020, fineness of grind to GB/T 13217.3, flow to GB/T 14624.3, tack to GB/T 18723, viscosity to GB/T 13217.4, setting to GB/T 13217.5 and adhesion to GB/T 13217.7.

6.2 Anti-counterfeiting identification property

6.2.1 Instruments and materials include, but are not limited to, a printability tester, a pencil hardness tester, print paper, a glass plate, an ink knife, a number 3 round paper clip and a paper cutter.

6.2.2.1 Test ink is taken evenly and a print is made on the print paper with the printability tester, the ink film being 1 μm to 2 μm thick, and cured by the method the supplier gives.

6.2.2.2 The print is cut into rectangles of 40 mm by 60 mm, one reference sample and three test samples being taken.

6.2.2.3 The test sample is laid flat on the stage of the pencil hardness tester, a number 3 round paper clip meeting QB/T 1149-2011 is fixed to the edge of the pencil holder in place of the pencil, a 1 kg weight is applied, and the edge of the paper clip is drawn across the surface of the sample at 200 mm/min; the change of colour of the mark on the sample is observed and the result recorded.

6.3 Resistance tests

6.3.1 Resistance to hot water, petrol and ethanol. The principle is the stability of the colour change feature of the ink print after it has been immersed for a set time in hot water, petrol or ethanol. The instruments and materials include, but are not limited to, a printability tester, print paper, an ink knife and paper cutter, beakers, tweezers, filter paper and a glass plate, a thermostatic water bath, and the reagents, namely deionized water at $(80 \pm 2) ^\circ\text{C}$, number 92 petrol as specified in GB 17930 and 95 % ethanol. The test runs as follows: a) test ink is taken evenly, a print made on the print paper with the printability tester and cured by the method the supplier gives; b) the print is cut into rectangles of 40 mm by 60 mm and, for each reagent, four prints are drawn at random, one serving as the comparison reference sample and three as test samples; c) the test samples are fully immersed in the reagent for

30 min and then taken out and dried on filter paper; d) the pressure sensitive colour change feature is tested by the method of 6.2.2.3 and the result recorded.

6.3.2 Resistance to light. The principle is the stability of the colour change feature of the ink print after the print has been exposed to daylight for a set time. The instruments and materials include, but are not limited to, a printability tester, print paper, an ink knife and paper cutter, a number 3 round paper clip, a daylight fading tester or weathering tester with a xenon lamp source, and the blue wool references for light and weather fastness together with the grey scale for assessing change in colour. The test runs as follows: a) the reference sample and the test samples are prepared by the method of 6.2.2; b) the test sample and the blue wool references specified in GB/T 730-2008 are each half covered with black card backed by white writing paper and placed in the fading tester, the ambient temperature and relative humidity being set as the tester requires, and exposed; exposure stops when the change of the grade 1 blue wool reference corresponds to grade 3 of the grey scale for assessing change in colour of GB/T 250-2008, and the sample is taken out and kept in the dark for 30 min before use; c) the pressure sensitive colour change feature is checked by the method of 6.2.2.3 and the result recorded.

6.3.3 Resistance to alkali. The principle is the stability of the colour change feature of the ink print after static contact with an alkaline medium for a period. The instruments and materials include, but are not limited to, a printability tester, print paper, an ink knife and paper cutter, a number 3 round paper clip, beakers, tweezers, filter paper and a glass plate, an oven, a pH meter and a 1 kg weight, and deionized water and a sodium hydroxide solution of 1 % by mass. The test runs as follows: a) the reference sample and the test samples are prepared by the method of 6.2.2; b) filter paper is immersed in the 1 % sodium hydroxide solution, taken out after 1 min and drained until no drop runs off; c) two soaked filter papers are laid on a glass plate, the cut test sample placed between the two layers, another glass plate placed on top and a 1 kg weight placed on that; d) after 10 min under pressure the test sample is taken out, rinsed clean with deionized water and dried in an oven at $(40 \pm 2) ^\circ\text{C}$ for 30 min; e) the pressure sensitive colour change feature is checked by the method of 6.2.2.3 and the result recorded.

6.3.4 Resistance to acid. The principle is the stability of the colour change feature of the ink print after static contact with an acid medium for a period. The instruments and materials used in the test are prepared as laid down in GB/T 18724. The test is carried out by the method laid down in GB/T 18724 and the pressure sensitive colour change feature is then checked by the method of 6.2.2.3 and the result recorded.

6.3.5 Resistance to heat. The principle is the stability of the colour change feature of the ink print after the print has been heated for a set time. The instruments and materials include, but are not limited to, a printability tester, print paper, an ink knife and blade, a number 3 round paper clip and an oven. The test runs as follows: a) the reference sample and the test samples are prepared as laid down in 6.2.2; b) the test sample is put in an electric blast