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**NATIONAL STANDARD OF THE
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**Test methods of color photoresist for flat panel display - Part 2:
Optical properties**

平板显示用彩色光刻胶测试方法 第2部分：光学性能

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1 Scope

The document describes the test methods for three optical performance indicators of colour photoresist for flat panel display, namely chromaticity, brightness and contrast.

It applies to the manufacture, the quality control and the research and development work on colour photoresist for flat panel display.

2 Normative references

The content of the documents listed below constitutes indispensable provisions of this document through normative reference in the text. For dated references, only the edition corresponding to that date applies; for undated references, the latest edition, including all amendments, applies.

GB/T 3979 Methods for the measurement of object colour; GB/T 5698 Colour terminology; GB/T 18910.11 Liquid crystal display devices - Part 1-1: Terms and symbols; GB/T 20147.4 Colorimetry - Part 4: CIE 1976 $L^* a^* b^*$ colour space; GB/T 43793.1-2024 Test methods of color photoresist for flat panel display - Part 1: Physical and chemical properties; CIE 1931 colour space.

3 Terms and definitions

The terms and definitions given in GB/T 3979, GB/T 5698 and GB/T 18910.11 and the following apply to this document.

3.1 standard source C: light source with a colour temperature of 6 774 K.

3.2 light state brightness: brightness measured with the colour filter in the maximum brightness state of the contrast meter.

3.3 dark state brightness: brightness measured with the colour filter in the minimum

brightness state of the contrast meter.

3.4 contrast ratio: ratio of the light state brightness to the dark state brightness of the colour filter.

4 Environmental conditions

Unless otherwise specified, the test is carried out under the following conditions.

- a) Light is excluded throughout the test process; a filter film may be added to the light source of the room in order to filter out ultraviolet light, stated in the document as below 500 nm.
- b) Ambient temperature: $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.
- c) Relative humidity: 30 % to 70 %.

5 Chromaticity and brightness test

5.1.1 Sample preparation equipment: includes but is not limited to the equipment that coats the colour photoresist on transparent glass and, through prebaking, exposure, development, postbaking and similar processes, prepares a colour filter with a specific uniform film thickness, the film thickness being usually not greater than 5 μm .

5.1.2 The microspectrophotometer is required as follows. a) Light source, wavelength range, wavelength interval and error: unless specially indicated, the light source shall be standard source C, with a halogen lamp or a cold cathode fluorescent lamp; the sampling wavelength range is 380 nm to 780 nm, the wavelength interval 1 nm or 5 nm and the error not greater than $\pm 0.5\text{ nm}$; the photometric repeatability shall be within 1 %. b) Calibration: the instrument is calibrated according to the manufacturer's instructions and the characteristics of the test instrument observed during the calibration are recorded, including linearity and wavelength shift; the calibration interval shall not exceed 2 years. c) Stability of the chromaticity and brightness test: with the sample at rest, 20 tests are made; the maximum error of the brightness shall not be greater than ± 0.05 and the maximum error of the chromaticity not greater than ± 0.0005 .

5.2 Sample conditioning: the test sample shall be uniform and free of bubbles, impurities and transparent gaps.

5.3 Test procedure, carried out in the following order. a) The colour photoresist is coated on a clean glass substrate and, following the prebaking, exposure, development and postbaking procedures agreed between supplier and purchaser, a colour filter meeting the test conditions is made and cut to the size specified in the operating instructions of the instrument. b) The power lines and data lines of the equipment are checked to be properly connected and free of looseness, the power supply is checked to be stable and the computer system to be working normally. c) According to the instructions for use of the

instrument, the microspectrophotometer is switched on and preheated to a stable state before measurement can start. d) The size and sharpness of the measuring spot or incident light spot of the microspectrophotometer are adjusted; on the surface of the test sample the size of that spot shall be smaller than the light transmitting area of the sample under test, and its diameter shall be not greater than 50 μm . e) A blank glass substrate of the same material as the sample substrate is used to measure the reference light quantity. f) The sample is placed on the sample stage of the test equipment so that the light source enters from the glass side of the sample. g) The chromaticity and brightness data of the sample are tested; where several samples are tested, the test area of each sample shall be the same. h) The film thickness of the test area is measured and recorded according to 7.4 of GB/T 43793.1-2024. i) The data are processed.

5.4 Data processing. a) The brightness and chromaticity of the sample shall be determined according to CIE 1931, brightness being expressed as Y and chromaticity as x and y; or they may be determined according to GB/T 20147.4, brightness being expressed as L^* and chromaticity as a^* and b^* , or brightness as L^* and chromaticity as u^* and v^* . b) The chromaticity test result shall be kept to 4 significant figures, the brightness test result to 2 significant figures and the film thickness to 5 significant figures.

5.5 The test report shall include the source, name and batch number of the test sample; the number of the test method standard used, that is the number of this document; the test conditions, namely the model of the instrument and equipment and the size of the test spot; the test date; and the test results obtained, namely brightness, chromaticity values and film thickness of the test area.

6 Contrast test

6.1.1 Sample preparation equipment: includes but is not limited to the equipment that coats the colour photoresist on transparent glass and, through prebaking, exposure, development, postbaking and similar processes, prepares a colour filter with a specific uniform film thickness.

6.1.2 The parameters of the contrast meter are as follows. a) Light source and error: unless specially indicated, the light source is generally standard source C, with a halogen lamp or a cold cathode fluorescent lamp, and the contrast error is not greater than 5 %. b) Test area: the test area of the sample shall be the effective area that the instrument can detect. c) Calibration: the instrument is calibrated according to the manufacturer's instructions and the characteristics of the test instrument observed during the calibration are recorded, including linearity and wavelength shift; the calibration interval does not exceed 2 years. d) Stability of the light state brightness, dark state brightness and contrast test: with the sample at rest, 10 tests are made; the relative standard deviation shall be not greater than $\pm 3\%$ for the light state brightness, not greater than $\pm 5\%$ for the dark state brightness and not greater than 5 % for the contrast. If the relative standard deviation is exceeded, the

test area shall be changed and the test repeated.

6.2 Test conditions: the test area shall be a single pixel of uniform film thickness and the test sample shall be free of bubbles, impurities and transparent gaps.

6.3 Test procedure, carried out in the following order. a) The colour photoresist is coated on a clean glass substrate and, following the prebaking, exposure, development and postbaking procedures, a colour filter meeting the test conditions is made and cut to the size specified in the operating instructions of the instrument. b) The power lines and data lines of the equipment are checked to be properly connected and free of looseness, the power supply is checked to be stable and the computer system to be working normally. c) According to the instructions for use of the instrument, the contrast meter is switched on and preheated to a stable state before measurement can start. d) The initial position, the light source and the internal calibration of the test equipment are set. e) A test is made with air as the base, with no sample in place, and the instrument is left to finish the test; when the air base contrast result is within the range $C \pm 1\%$ of the measuring range, the subsequent test data are reliable. f) The sample is placed on the sample stage of the test equipment so that the light source enters from the glass side of the sample. g) The light state brightness and the dark state brightness of the sample are tested. h) The data are processed.

6.4 Data processing: the contrast is expressed as CR and calculated by formula (1) as the ratio of $L_{\max}$ to $L_{\min}$. In the legend of the formula the document prints CR as the contrast, then $L_{\max}$ as the light state brightness, also called the brightness with the polarizers parallel, in candela per square metre, and then again $L_{\max}$, this time as the dark state brightness, also called the brightness with the polarizers perpendicular, in candela per square metre. The symbol is printed twice as $L_{\max}$; see the note at the end of this record. The chromaticity test result is kept to 4 significant figures and the contrast test result to the units digit.

6.5 The test report shall include the source, name and batch number of the test sample; the number of the test method standard used, that is the number of this document; the test conditions, namely the model of the instrument and equipment and the environmental conditions; the test date; and the test results obtained, namely the contrast, brightness and chromaticity of the air base and the contrast CR of the sample.

Note Notes on the original text

In the legend of formula (1) in 6.4 the symbol $L_{\max}$ is printed twice, once for the light state brightness and once for the dark state brightness, while the formula itself is printed as CR equal to $L_{\max}$ divided by $L_{\min}$. The legend for the dark state brightness therefore does not match the symbol used in the formula. The text is reported as printed and is not corrected here.