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Binders for paints and varnishes — Rosin — Sampling and sample preparation for colour measurement

Liants pour peintures et vernis — Colophane — Échantillonnage et préparation des échantillons pour le mesurage de la couleur

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 13632 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 10, *Test methods for binders for paints and varnishes*.

Binders for paints and varnishes — Rosin — Sampling and sample preparation for colour measurement

1 Scope

This International Standard specifies a procedure for sampling of rosin and rosin derivatives from

— drums,

— the molten/liquid form,

— flakes, pellets or pastilles

and preparation of the samples for colour measurement. The method to be used for the colour measurement is specified in other standards. The colour of the rosin can be measured with neat rosin or rosin in solution.

The two most commonly used colour-measurement methods are those based on the USDA[1)] scale and the Gardner colour scale. Annex A provides information on the correlation between these two scales.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4630-1, *Clear liquids — Estimation of colour by the Gardner colour scale — Part 1: Visual method*

ISO 4630-2, *Clear liquids — Estimation of colour by the Gardner colour scale — Part 2: Spectrophotometric method*

ASTM D509, *Standard Test Methods of Sampling and Grading Rosin*

3 Sampling and sample preparation

3.1 Procedure for Gardner colour measurement of neat rosin

The sample to be tested shall consist of freshly broken lumps and shall be free of dust and finely divided material.

Melt a sufficient amount of material in a clean container using an oven, hotplate, heat gun, sand bath or oil bath in an inert-gas atmosphere, taking care to avoid overheating. Stir slowly, avoiding the formation of bubbles. Melt the sample completely, but do not heat it above the temperature necessary for the sample to pour readily. The time from the beginning of heating to pouring the sample shall not exceed 15 min.

Pour the molten sample into a test tube or cuvette and, while the sample is still molten, insert the tube or cuvette into the measurement instrument and measure the colour.

3.2 Procedure for Gardner colour measurement of rosin in solution

The sample to be tested shall consist of freshly broken lumps and shall be free of dust and finely divided material.

Prepare a 50,0:50,0 (by mass) solution of the test material in analytical-grade toluene in a clean beaker or flask. Stir or shake gently at room temperature until the rosin is dissolved and pour the solution into a test tube or cuvette.

1) USDA — United States Department of Agriculture.

Insert the test tube or cuvette into the measurement instrument and measure the colour. The time from the beginning of sample preparation to pouring the sample shall not exceed 15 min.

3.3 Procedure for USDA colour

The sample to be tested shall consist of freshly broken lumps and shall be free of dust and finely divided material.

Melt a sufficient amount of material in a small beaker, using an oven, hotplate, heat gun, sand bath or oil bath in an inert-gas atmosphere, taking care to avoid overheating. Stir slowly, avoiding the formation of bubbles. Melt the sample completely, but do not heat it above the temperature necessary for the sample to pour readily.

Prepare a sample for testing by pouring the molten material into a mould measuring 22,2 mm in the direction in which it will be viewed during colour measurement. The time from the beginning of heating to pouring the sample shall not exceed 15 min.

4 Colour measurement

Measure the Gardner colour as described in ISO 4630-1 or ISO 4630-2 or the USDA colour as described in ASTM D509.

5 Test report

In addition to the information requested in the test reports given in ISO 4630-1, ISO 4630-2 and ASTM D509, state the method of sample preparation.

Annex A
(informative)

Correlation between Gardner colour scale and USDA scale[2)]

A.1 General

When testing rosin, it has historically been customary to use the USDA scale as defined in ASTM D509. Some users nevertheless prefer to use the Gardner scale as defined in ISO 4630-1. This annex describes a method of calculating the Gardner scale values which are equivalent to the rosin standards used in ASTM D509, taking into consideration the different path lengths used by the two methods.

The visual method, specified in ISO 4630-1, of estimation of colour by the Gardner colour scale requires the test sample to be in a glass test tube, preferably of inside diameter 10,65 mm. This is usually approximated by a square cuvette with a path length of 10 mm. The USDA scale uses a 22,2 mm cube of material.

A.2 Procedure

The CIE x,y chromaticity coordinates and luminous transmittance Y corresponding to the 18 standards making up the Gardner colour scale have been taken from ISO 4630-1.

The spectral-transmittance data for the 12 standards making up the USDA scale have been taken from ASTM D509. To find the equivalent values of transmittance for a 10 mm path length, these values were raised to the power of 10,0/22,2. This calculation assumes that Beer's law can be applied to the samples.

Table A.1 shows the x,y and Y data for the Gardner colour scale and similar data calculated from the "corrected" USDA scale transmittance data. Note that the spectral-transmittance values for the three lightest USDA scale values, XA, XB and XC, are not given in ASTM D509. In order to be able to determine their Gardner equivalents, these spectral-transmittance values were measured using the actual glass standards specified in ASTM D509 and a path length of 22,2 mm.

2) This annex applies to neat rosin and rosin derivatives.

Table A.1 — x,y and Y data for the Gardner colour scale and similar data calculated from the USDA scale

Gardner colour scale				USDA scale			
	x	y	Y		x	y	Y
1	0,317 7	0,330 3	80,0	XC	0,324 9	0,343 2	92,62
2	0,323 3	0,335 2	79,0	XB	0,343 6	0,371 9	89,22
3	0,332 9	0,345 2	76,0	XA	0,364 6	0,400 6	84,84
4	0,343 7	0,364 4	75,0	X	0,380 5	0,415 8	79,20
5	0,355 8	0,384 0	74,0	WW	0,398 1	0,430 3	73,91
6	0,376 7	0,406 1	71,0	WG	0,414 8	0,442 2	69,15
7	0,404 4	0,435 2	67,0	N	0,434 8	0,453 9	63,56
8	0,420 7	0,449 8	64,0	M	0,456 6	0,463 3	57,02
9	0,434 3	0,464 0	61,0	K	0,481 2	0,468 8	49,23
10	0,450 3	0,476 0	57,0	I	0,506 5	0,467 5	41,22
11	0,484 2	0,481 8	45,0	H	0,532 6	0,457 4	31,84
12	0,507 7	0,463 8	36,0	G	0,555 7	0,439 7	24,69
13	0,539 2	0,445 8	30,0	F	0,604 0	0,395 4	15,50
14	0,564 6	0,427 0	22,0	E	0,629 7	0,369 9	8,38
15	0,585 7	0,408 9	16,0	D	0,670 6	0,329 2	2,79
16	0,604 7	0,392 1	11,0				
17	0,629 0	0,370 1	6,0				
18	0,647 7	0,352 1	4,0				

Intermediate points were then calculated for the Gardner colour scale by linear interpolation to an accuracy of 0,1 scale units and, for each point on the USDA scale, the nearest point on this expanded Gardner colour scale was determined by finding the smallest difference in the x,y chromaticity space. The resulting Gardner values are tabulated in Table A.2.

Table A.2 — Nearest Gardner equivalent to each point on the USDA scale

USDA scale	Gardner colour scale	Colour difference ΔE
XC	2,5	7,32
XB	4,3	7,13
XA	5,6	7,06
X	6,2	5,59
WW	6,8	3,51
WG	7,6	2,22
N	8,6	3,41
M	9,9	6,21
K	11,2	6,81
I	11,9	6,30
H	12,7	8,33
G	13,5	3,88
F	15,9	13,25
E	17,0	11,66
D	18,0	9,17

Also shown in Table A.2 is the CIELAB colour difference ΔE between each USDA scale colour and its nearest Gardner equivalent.

Table A.3 gives the CIE x,y chromaticity coordinates and luminous transmittance Y corresponding to the Gardner values equivalent to the values on the USDA scale.

Table A.3 — CIE coordinates corresponding to the Gardner values equivalent to the values on the USDA scale

USDA scale	Gardner colour scale	x	y	Y
XC	2,5	0,328 1	0,340 2	77,5
XB	4,3	0,347 3	0,370 3	74,7
XA	5,6	0,368 3	0,397 3	72,2
X	6,2	0,382 2	0,411 9	70,2
WW	6,8	0,398 9	0,429 4	67,8
WG	7,6	0,414 2	0,444 0	65,2
N	8,6	0,428 9	0,458 3	62,2
M	9,9	0,448 7	0,474 8	57,4
K	11,2	0,488 9	0,478 2	43,2
I	11,9	0,505 4	0,465 6	36,9
H	12,7	0,529 8	0,451 2	31,8
G	13,5	0,551 9	0,436 4	26,0
F	15,9	0,602 8	0,393 8	11,5
E	17,0	0,629 0	0,370 1	6,0
D	18,0	0,647 7	0,352 1	4,0

It is possible that a different form of interpolation, e.g. cubic spline or Lagrange, would give slightly different results. However, the differences between such results and those found by linear interpolation, as tabulated above, are likely to be very small.

Figure A.1 shows the correlation between the two scales.