
**Clear liquids — Estimation of colour
by the platinum-cobalt scale**

*Liquides clairs — Évaluation de la couleur au moyen de l'échelle
platine-cobalt*



Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 6271 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 10, *Test methods for binders for paints and varnishes*.

This second edition cancels and replaces the first edition (ISO 6271:1981), which has been technically revised. The main change is that some of the Pt-Co standard matching solutions, particularly those having very low Pt-Co concentrations, have been deleted from table 2 because of the limited precision of the colour comparison at these concentrations.

Annex A forms an integral part of this International Standard.

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Introduction

ISO 2211, *Liquid chemical products — Measurement of colour in Hazen units (platinum-cobalt scale)*, is not suitable for use in the paint industry.

ISO 6271 differs from ISO 2211 in respect to:

- preparation of the stock solution for colour matching (in one way only);
- checking of the stock solution;
- use of tubes with greater viewing depth to obtain a more distinct difference between successive colour standards;
- the single test procedure given is more accurate.

The term “platinum-cobalt colour” used here is preferred over the terms “Hazen colour” and “APHA colour”.

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Clear liquids — Estimation of colour by the platinum-cobalt scale

1 Scope

This International Standard specifies a method for estimating the colour, in Pt-Co units, of clear liquids.

It is applicable to clear liquids having colour characteristics similar to those of the reference platinum-cobalt scale.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 842: 1984, Raw materials for paints and varnishes - Sampling.

ISO 3696: 1987, Water for analytical laboratory use - Specifications and test methods.

3 Definition

For the purposes of this International Standard, the following definition applies:

3.1 Pt-Co unit: The colour of a solution containing 1 mg of platinum, in the form of the hexachloroplatinate ion, in the presence of 2 mg of cobalt(II) chloride hexahydrate per litre.

4 Principle

The colour of a test portion of the product to be tested is compared with those of colour standards. The standard that most closely matches the colour of the test portion is identified and the result is expressed in terms of Pt-Co units.

5 Reagents

During the test, use only reagents of recognized analytical grade and only water of at least grade 3 purity in accordance with ISO 3696.

5.1 Potassium hexachloroplatinate (K_2PtCl_6).

5.2 Cobalt(II) chloride hexahydrate ($CoCl_2 \cdot 6H_2O$).

5.3 Hydrochloric acid, 38 % (m/m), ($\rho \approx 1,19$ g/ml).

6 Apparatus

Ordinary laboratory apparatus and glassware, together with the following.

6.1 Colour comparison tubes, flat-bottomed, 100 ml capacity, fitted with optically clear ground-glass caps. The tubes shall be matched with respect to the colour and the thickness of the glass and shall have a graduation mark between 275 mm and 295 mm above the bottom. The tubes shall be selected so that the graduation mark heights match to within 3 mm. ¹⁾

6.2 Colour comparator, designed to permit visual comparison of light transmitted through the colour comparison tubes (6.1) along their longitudinal axis. The comparator shall be designed so that white light is passed through, or reflected off, a white glass plate and directed with equal intensity through the tubes, and shall be shielded so that no light enters the tubes from the sides.

6.3 Spectrometer, capable of measuring light transmittance at 430 nm, 455 nm, 480 nm and 510 nm with an accuracy of 0,005 or better.

6.4 Cells, of optical path length 10 mm, for use with the spectrometer (6.3).

7 Preparation of colour standards

7.1 Pt-Co stock solution, 500 Pt-Co units

Into a 400 ml beaker introduce 1,245 g of potassium hexachloroplatinate (5.1) and 1,000 g of cobalt(II) chloride hexahydrate (5.2). Add 100 ml of water and 100 ml of hydrochloric acid (5.3) and warm, if necessary, to obtain a clear solution. After cooling, transfer quantitatively to a 1000 ml one-mark volumetric flask, dilute to the mark with water and mix well.

The stock solution prepared in this way shall have transmittances at 430 nm, 455 nm, 480 nm and 510 nm which lie within the limits specified in table 1 when measured using the cells (6.4) in the spectrometer (6.3).

Table 1 - Transmittance (and absorbance) tolerance limits for 500 Pt-Co unit stock solution

Wavelength nm	Transmittance	Absorbance
430	0,759 to 0,776	0,110 to 0,120
455	0,716 to 0,741	0,130 to 0,145
480	0,759 to 0,785	0,105 to 0,120
510	0,861 to 0,881	0,055 to 0,065

¹⁾ These colour comparison tubes (Nessler tubes) are available commercially. Details may be obtained from the Secretariat of ISO/TC 35/SC 10.

7.2 Pt-Co standard matching solutions

Prepare a series of standard matching solutions covering the range required (see table 2). Place the indicated volumes of stock solution (7.1) into a series of 100 ml colour comparison tubes (6.1), dilute to the mark with water and mix well. Cap the tubes, seal the caps with shellac or waterproof cement and mark the tubes with the corresponding Pt-Co number.

Table 2 - Pt-Co standard matching solutions

Colour Pt-Co units	Volume of stock solution (7.1) ml
0	0
10	2
20	4
30	6
40	8
50	10
60	12
70	14
80	16
90	18
100	20
125	25
150	30
200	40
250	50
300	60
350	70
400	80
450	90
500	100

7.3 Storage

Store the stock solution (7.1) in a stoppered bottle in the dark. Under these conditions this solution is stable for 1 year. The standard matching solutions (7.2) are stable for about 6 months when stored in the dark at room temperature. They must remain clear without any sediment but should preferably be prepared immediately before use.

8 Sampling

Take a representative sample of the product to be tested, as described in ISO 842 or in other specified or agreed International Standards.

9 Procedure

Pour into one of the colour comparison tubes (6.1) a quantity of the sample sufficient to fill it to the graduation mark, passing the sample through a filter if it has any visual turbidity, so that a clear liquid is obtained.

Cap the tube, place it in the comparator (6.2) and compare with the standard matching solutions (7.2) until the closest match is obtained.

NOTE 1 Instruments are available that permit visual comparison of a liquid of a given depth of colour, with a moving tinted glass disc corresponding to the different standard matching solutions. The use of such instruments, with its very stable standards, is permissible provided that the instrument gives correct values when checked against the colour standards, prepared as described in clause 7. The use of spectrometers for Pt-Co colour measurement is not permissible because results will be obtained which are not generally comparable with those obtained using Pt-Co colour standards.

10 Expression of results

10.1 Express the colour of the sample as the colour, in Pt-Co units, of the standard matching solution (7.2) having the closest match to the sample. If the colour lies midway between two standard matching solutions, report the darker of the two.

10.2 If the colour characteristics of the sample differ from those of the standard matching solutions, so that a definite match cannot be obtained, report the range over which an apparent match is obtained and give a description of the observed colour, or report as "off hue".

11 Precision

See annex A.

12 Test report

The test report shall contain at least the following information:

- a) all details necessary to identify the product tested;
- b) a reference to this International Standard (ISO 6271);
- c) the result of the test as indicated in 10.1 or 10.2; if the result has been obtained on a filtered sample as described in clause 8, this should be mentioned;
- d) any deviation from the test method specified;
- e) the date of the test.

Annex A (normative)

Precision

The data given in A.1 and A.2 are applicable only to samples that match exactly the hue of the standard. Poorer precision will be obtained as the hue of the sample departs from that of the standards.

A.1 Repeatability (r)

The value below which the absolute difference between two single test results, each the mean of duplicates, obtained on identical material by one operator in one laboratory within a short interval of time using the standardized test method may be expected to lie with a 95 % probability is 5 %.

A.2 Reproducibility (R)

The value below which the absolute difference between two test results, each the mean of duplicates, obtained on identical material by operators in different laboratories using the standardized test method may be expected to lie with a 95 % probability is 15 %.

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