
**Caprolactam for industrial use —
Determination of colour of 50 %
aqueous caprolactam solution,
expressed in Hazen units (platinum-
cobalt scale) — Spectrometric method**

*Caprolactame à usage industriel — Détermination de la coloration
d'une solution aqueuse à 50 % de caprolactame, exprimée en unités
Hazen (échelle platine-cobalt) — Méthode spectrométrique*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 8112:1984), which has been technically revised.

The main changes are as follows:

- the option to use a flow-through cell for the absorption measurement has been added;
- the temperature of measured solution has been taken into account.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Caprolactam for industrial use — Determination of colour of 50 % aqueous caprolactam solution, expressed in Hazen units (platinum-cobalt scale) — Spectrometric method

1 Scope

This document specifies a spectrometric method of determining the colour, expressed in Hazen units, of a 50 % aqueous caprolactam solution as a measure of coloured impurities content of the sample.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2211, *Liquid chemical products — Measurement of colour in Hazen units (platinum-cobalt scale)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

Pt/Co scale

colour expressed in Hazen units

number which indicates the amount of platinum, in milligrams per litre, in the standard solution the absorbance of which, measured at a wavelength of 390 nm, is equal to that of the 50 % aqueous solution of caprolactam measured at the same conditions

4 Principle

The absorbance of a solution of a 50 % aqueous caprolactam solution is measured at a wavelength of 390 nm and optical path length of 50 mm using a spectrometer, and expressed in Hazen units by multiplying the absorbance measured by a constant factor equal to 150.

This factor is derived from measurements of absorbance of diluted standard solutions of platinum-cobalt scale (Pt/Co scale) in accordance with ISO 2211.

5 Reagents

During the analysis, use only distilled water or water of equivalent purity.

6 Apparatus

Ordinary laboratory apparatus and spectrometer, capable of measuring the absorbance at a wavelength of 390 nm.

6.1 Spectrometer, capable of measuring the absorbance at a wavelength of 390 nm.

6.2 Two cells, of optical glass or quartz with path length 50 mm.

Or alternatively

6.3 One flow-through cell, made of optical glass or quartz with a path length of 50 mm in combination with a pump system.

7 Procedure

7.1 Weigh $(50 \pm 0,1)$ g of caprolactam, place in a 250 ml conical flask and dissolve in $(50 \pm 0,1)$ ml of water. Allow the solution to stand till the air bubbles disappear. Allow the solution to cool down to room temperature in case of preparing the solution with liquid (melted) caprolactam or let it warm to room temperature in case of preparing the solution with solid caprolactam.

7.2 Fill the two cells (6.2) with water. Adjust the spectrometer (6.1) for measuring absorption difference at a wavelength of 390 nm. Measure the possible difference in absorbance of the cells and correct the result obtained by the procedure specified in 7.3.

7.3 Replace the water in the sample cell by the caprolactam solution (see 7.1) and measure the absorbance of the caprolactam solution at a wavelength of 390 nm, after having adjusted the instrument to zero absorbance against water.

7.4 In case of a flow-through cell measurement setup (6.3), set instrument for measurements at 390 nm. Adjust the equipment to zero absorbance with water and measure the absorbance of test solution (see 7.1). Rinse cell with water and check the effectiveness of the rinsing with the measurement of another water sample.

NOTE Typically, rinsing with 20 to 30 times the volume of the cell plus connecting tubing will result in sufficient exchange of sample or water.

The difference between parallel measurements should not exceed 0,002 5.

8 Expression of results

The colour of the caprolactam solution, expressed in Hazen units (platinum-cobalt scale), is given by [Formula \(1\)](#):

$$A_H = 150 \times A_{390} \quad (1)$$

where

A_H is the absorbance of the caprolactam solution (7.1) at a wavelength of 390 nm expressed in Hazen units;

A_{390} is the absorbance of the caprolactam solution (7.1) at a wavelength of 390 nm in a cell with an optical path length of 50 mm, taking into account the absorption difference of the cells;

150 is the calculation factor for conversion into Hazen units.

Round the result to the nearest whole number.

If cells of different optical path length are used, correct the calculation factor by multiplying by $50/l$, where l is the optical path length, in millimetres, of the cells used. The difference between parallel measurements should not exceed $0,000\ 05 \cdot l$ of absorbance.

NOTE In the original Hazen test, the colours are compared visually. The results obtained in the spectrometric method cannot be compared with the results of the original visual Hazen test (see ISO 2211).

9 Test report

The test report shall include the following particulars:

- a) an identification of the sample;
- b) the reference of the method used;
- c) the results and the method of expression used;
- d) any unusual features noted during the determination;
- e) any operations not included in this document or in the document to which reference is made, or regarded as optional;
- f) a reference to this document, including the year of publication;
- g) the manufacturer and the type of instrument used;
- h) any applicable test details such as rinsing volume, etc.;
- i) the date of the test.

The test report shall be renumbered accordingly.

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