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भारतीय मानक मसौदा

क्लोरोप्लेटिनिक एसिड (प्लैटिनम क्लोराइड) — विशिष्टि

(*IS 7038 का पहला पुनरीक्षण*)

Draft Indian Standard

CHLOROPLATINIC ACID (PLATINUM CHLORIDE) — SPECIFICATION

(*First Revision of IS 7038*)

ICS 71.060

Electroplating Chemicals and Photographic Materials Sectional Committee, CHD 5	**Last Date for Comments: 03 November 2025**

FOREWORD

(*Formal clause will be added later*)

Chloroplatinic acid is the starting material for the preparation of most platinum compounds. One of the most important use of this material is in the electroplating industry where surface protection and decorative purposes are principal considerations, or where subsequent operations such as metal bonding or soldering are required. This material also finds use in the preparation of 'liquid platinum', a mixture of organometallic compounds of platinum with various organic vehicles, besides its deposition in disperse forms such as in finely divided metal blocks or colloidal solutions and supported catalysts.

This standard was first published 1973. In this revision, alternative instrumental test method ICP-MS has been incorporated for the determination of platinum. The relevant clauses have been added and the references have been updated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

CHLOROPLATINIC ACID (PLATINUM CHLORIDE) — SPECIFICATION

(*First Revision*)

1 SCOPE

This standard prescribes requirements and methods of sampling and test for chloroplatinic acid (platinum chloride).

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards:

IS No.	*Title*
IS 266 : 2024	Sulphuric acid — Specification (*fourth revision*)
IS 321 : 1964	Specification for absolute alcohol (*first revision*)
IS 1070 : 2023	Reagent grade water — Specification (*fourth revision*)
IS 3025 (Part 65) : 2025/ISO 17294-2 : 2023	Methods of sampling and test (physical and chemical) for water and wastewater: (Part 65) : Application of inductively coupled plasma mass spectrometry (ICP-MS) — Determination of selected elements including uranium isotopes (*second revision)*
IS 4408 : 2024	Sodium chloride, analytical reagent — Specification (*second revision*)
IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)

3 REQUIREMENTS

3.1 Description

The material shall be in the form of deep orange crystalline mass, rapidly deliquescent, and soluble in water and alcohol. It shall be free from dirt, foreign matter and visible impurities. The composition of the material shall correspond essentially to the formula $H_2PtCl_6.4.5H_2O$.

3.2 The material shall also comply with the requirements prescribed in Table 1 when tested according to the methods prescribed in Annex A. Reference to the relevant clauses of Annex A is given in col (4) of the table.

Table 1 Requirement for Chloroplatinic Acid (Platinum Chloride)

(*Clauses* 3.2 and A-6.2.1)

Sl. No	**Characteristic**	**Requirements**	**Method of Test (Ref to Cl No. of Annex A)**
(1)	(2)	(3)	(4)
i)	Solubility in water	To pass the test	**A-2**
ii)	Platinum (as Pt), percent by mass, *Min*	39.5	**A-3**
iii)	Nitrates (as NO_3)	To pass the test	**A-4**
iv)	Sulphates (as SO_4)	To pass the test	**A-5**
v)	Alkali salts and metals soluble in nitric acid, percent by mass, *Max*	0.2	**A-6**
vi)	Suitability for potassium determination	To pass the test	**A-7**

4 PACKING AND MARKING

4.1 Packing

The material shall be packed in tightly closed bottles.

4.2 Marking

The bottles shall be marked with the following:

a) Name of the material;

b) Net mass with equivalent mass of platinum (in bracket);

c) Name of manufacturer and recognized trade-mark, if any; and

d) Date and batch No. of Manufacture to enable the material to be traced from records.

4.2.1 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

5 SAMPLING

The method of preparing representative samples of the material and the criteria for its conformity to this specification shall be as prescribed in Annex B.

ANNEX A

(*Clause* 3.2)

METHOD OF TEST FOR CHLOROPLATINIC ACID (PLATINUM CHLORIDE)

A-1 QUALITY OF REAGENTS

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2 TEST FOR SOLUBILITY

A-2.1 Procedure

Weigh accurately about 2.5 g of the material and dissolve in 25 ml of water. The solution shall be clear. Upon filtering through a tared sintered glass crucible (G. No. 4) followed by washing with about 100 ml of warm water, there shall be no increase in the mass of the crucible on drying at 105 °C ± 2 °C for 1 h. Reserve the filtrate for subsequent test.

A-3 DETERMINATION OF PLATINUM

A-3.1 General

Three methods are described for the determination of platinum. Either of these may be used for general routine purposes, but in case of a dispute Method C shall be the referee method.

A-3.1.1 In the gravimetric method platinum is determined after precipitation as ammonium chloroplatinate [$(NH_4)_2$. $PtCl_6$].

A-3.2 Reagents

A-3.2.1 *Concentrated Sulphuric Acid* **—** *see* IS 266 (to be used in electrolytic method only)

A-3.2.2 *Ammonium Chloride* **—** saturated solution

A-3.2.3 *Absolute Alcohol — see* IS 321

A-3.3 Procedure

A-3.3.1 *Preparation of the Solution* — Transfer the filtrate reserved in **A-2.1** to a 250 ml volumetric flask, and dilute to the mark with water.

A-3.3.2 *Method A — Electrolytic*

Transfer 100 ml aliquot of the solution prepared in **A-3.3.1** to a tared platinum dish. Add 2 ml of concentrated sulphuric acid. Using the dish as the cathode, with a rotating anode, electrolyse the solution at a temperature of 55 °C to 60 °C using a current of 0.4 A for about 4 h. Wash the split watch-glass frequently during the period of electrolysis.

A-3.3.2.1 At this stage place a drop of solution on a white glazed tile followed by two drops of sodium hydroxide solution. Add 2 drops of acetic acid and make sure that no pale-yellow to orange coloration is produced, confirming complete electrolysis. Then rinse the platinum dish, containing the deposit, with water. Dry and ignite for 5 min at dull red heat. Cool and weigh.

A-3.3.2.2 *Calculation*

$$\text{Platinum (as Pt), percent by mass} = \frac{M_2 - M_1}{M}$$

where

M_2 = mass in g, of the platinum dish after electrolysis;

M_1 = mass in g, of the platinum dish before electrolysis; and

M = mass in g, of the material in the aliquot taken for the test.

A-3.3.3 *Method B — Gravimetric*

Measure out 50 ml aliquot of the prepared solution (*see* **A-3.3.1**) and evaporate to about 10 ml. Add 10 ml of saturated solution of ammonium chloride, cover and allow to stand overnight. Filter through a tared sintered glass

crucible (G. No. 4) and wash with alcohol. Dry the crucible with precipitate at a temperature below 100 °C to a constant mass as ammonium chloroplatinate $(NH_4)_2\,PtCl_6$.

A-3.3.3.1 *Calculation*

$$\text{Platinum (as Pt), percent by mass} = \frac{43.95 \times M_3}{M}$$

where

M_3 = mass in g, of the precipitate; and

M = mass in g, of the material in the aliquot taken for the test.

A-3.3.4 *Method C*

Determine platinum content by ICP-MS in accordance with the method prescribed in IS 3025 (Part 65).

A-4 TEST FOR NITRATES

A-4.1 Reagents

A-4.1.1 *Concentrated Sulphuric Acid — see* IS 266

A-4.1.2 *Ferrous Sulphate Solution* — 10 percent (*m/v*)

A-4.2 Procedure

Measure out 20 ml of the prepared solution and (*see* **A-3.3.1**) and evaporate to about 5 ml. Add 2 ml of concentrated sulphuric acid and overlay it with 2 ml of ferrous sulphate solution.

A-4.2.1 The material shall be taken to have passed the test if no reddish-brown colour is produced at the interface of the liquids.

A-5 TEST FOR SULPHATES

A-5.1 Reagent

A-5.1.1 *Barium Chloride Solution* **—** 10 percent (*m/v*).

A-5.2 Procedure

Measure out 50 ml of the prepared solution (*see* **A-3.3.1**) and evaporate to about 20 ml. Add 2 ml of barium chloride solution and allow to stand for 1 h**.**

A-5.2.1 The material shall be taken to have passed the test if no turbidity or precipitate is produced in the solution.

A-6 DETERMINATION OF ALKALI SALTS AND METALS SOLUBLE IN NITRIC ACID

A-6.1 Reagents

A-6.1.1 *Dilute Nitric Acid* **—** 20 percent (*v/v*)

A-6.2 Procedure

Weigh accurately 1 g of the material and ignite. Cool and digest the residue with 15 ml of dilute nitric acid on a water-bath for 15 min. Filter the liquid, collecting the filtrate and washings in a 100 ml platinum evaporating dish. Evaporate the filtrate and ignite the residue.

A-6.2.1 The material shall be taken as not having exceeded the limit prescribed in Table 1 if the mass of the ignited residue does not exceed 0.002 g.

A-7 TEST FOR SUITABILITY FOR DETERMINATION POTASSIUM

A-7.1 Reagents

A-7.1.1 *Potassium Chloride Solution* — Dissolve 7.456 g of potassium chloride, previously dried at 105 °C, in water and make up to a volume of 1 000 ml.

A-7.1.2 *Sodium Chloride — see* IS 4408.

A-7.1.3 *Alcohol* — 85 percent (*v/v*).

A-7.2 Procedure

Measure out 10 ml of potassium chloride solution in a 250 ml beaker, add 0.1 g to 0.11 g of sodium chloride and dilute to about 100 ml. Heat on a water-bath and add 0.9 g to 1 g of the material dissolved in 10 ml of water. Evaporate to substantial dryness on a water-bath (the residue may be slightly moist). Add 10 ml of alcohol, break up any lumps with a stirring rod and decant through a sintered glass crucible (G. No. 4). Leach with 5 successive 10 ml portions of alcohol decanting through the same sintered glass crucible. Reject the filtrate.

A-7.2.1 Allow the alcohol to evaporate both from the beaker and the crucible. Dissolve the precipitate in the crucible with hot water and add the solution to the residue in the beaker. When the salt is dissolved, transfer solution to a tared evaporating dish and evaporate to dryness. Dry the residue at 105 °C for 1 h and weigh.

A-7.2.2 The material shall be taken to have passed the test if the mass of the residue is between 0.242 5 and 0.244 0 g.

ANNEX B

(*Clause* 5)

SAMPLING OF CHLOROPLATINIC ACID (PLATINUM CHLORIDE) AND CRITERIA FOR CONFORMITY

B-1 GENERAL REQUIREMENTS OF SAMPLING

The sampling implement and the sample container shall be clean and dry.

B-2 SCALE OF SAMPLING

B-2.1 In a single consignment, all the containers from the same batch of manufacture shall be grouped together to form a lot.

B-2.2 Each lot shall be separately tested for ascertaining its conformity to the specification. The number of containers (*n*) to be sampled from each lot is given in Table 2. These *n* containers shall be selected at random with the help of random number table. Guidance for random selection procedures may be had from. IS 4905.

Table 2 Scale of Sampling

(*Clause* B-2.2)

Sl No.	*Lot Size* (*N*)	*Sample Size* (*n*)
(1)	(2)	(3)
i)	Up to 10	1
ii)	11 to 50	2
iii)	51 and above	3

B-3 NUMBER OF TEST

From each of the selected containers 3 g of chloroplatinic acid shall be withdrawn. These portions shall be thoroughly mixed to form a composite sample. Tests for all characteristics shall be conducted on this composite sample.

B-4 CRITERIA FOR CONFORMITY

All the test results shall satisfy the corresponding requirements if the lot is to be accepted as conforming to this specification.