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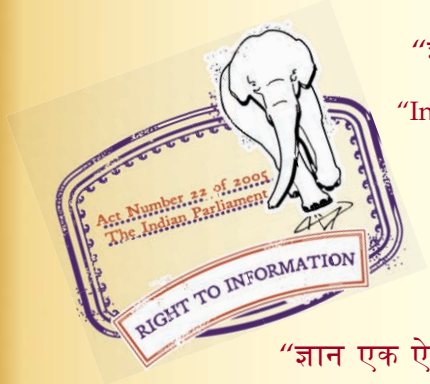

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SPECIFICATION FOR CHINA CLAY FOR EXPLOSIVE AND PYROTECHNIC INDUSTRY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 December 1974, after the draft finalized by the Explosives and Pyrotechnics Sectional Committee had been approved by the Chemical Division Council.

0.2 China clay is a naturally occurring mineral which is widely used in explosive formulations, both commercial and military. Though there are other Indian Standards for this material covering the requirements of various industries, none of these standards can be adopted even after additions/alterations for the material required for explosive industry. The formulators and manufacturers of explosives since a long time have been experiencing difficulty in procuring material of suitable quality. This standard has been formulated with a view to facilitating procurement of standard quality of china clay for explosive and pyrotechnic industry.

0.3 This standard is one of the series of Indian Standards on china clay. Other standards on this subject are:

IS : 68-1950 Specification for kaolin for paints

IS : 505-1968 Specification for light kaolin (*first revision*)

IS : 1463-1967 Specification for kaolin for cosmetic industry (*first revision*)

IS : 2840-1965 Specification for china clay for ceramic industry

0.4 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 : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for china clay for use in explosive and pyrotechnic industry.

*Rules for rounding off numerical values (*revised*).

2. REQUIREMENTS

2.1 Description — The material shall essentially consist of hydrated aluminium silicate, in dry powder form. It shall be white to off-white in colour and free from extraneous impurities and grit.

2.2 The material shall comply with the requirements prescribed in Table 1 when tested according to the methods prescribed in Appendix A. Reference to the relevant clauses of Appendix A is given in col 4 of the table.

TABLE 1 REQUIREMENTS FOR CHINA CLAY FOR USE IN EXPLOSIVE AND PYROTECHNIC INDUSTRY

Sl No.	Characteristic	Requirement	Method of Test (Ref to Cl No. in Appendix A)
(1)	(2)	(3)	(4)
i)	Loss on drying, percent by mass, *Max*	1·5	A-2
ii)	Loss on ignition, percent by mass, *Max*	14	A-3
iii)	Matter soluble in dilute hydrochloric acid, percent by mass, *Max*	1·5	A-4
iv)	Matter soluble in water, percent by mass, *Max*	0·5	A-5
v)	Grit, percent by mass, *Max*	0·001	A-6
vi)	Fineness (material retained on 63-micron IS sieve), percent by mass, *Max*	1·0	A-7
vii)	Bulk density, g/ml	0·65-0·90	A-8
viii)	*p*H (of aqueous extract)	6·0-7·5	A-9
ix)	Oil absorption, ml per 100 g	35-45	A-10

3. PACKING AND MARKING

3.1 Packing — Unless agreed to otherwise between the purchaser and the supplier the material shall be packed in clean jute bags with polyethylene liner.

3.2 Marking — The packages shall be marked legibly and indelibly with the following information:

a) Name and description of the material;

b) Net mass of the material;

c) Manufacturer's name and/or his recognized trade-mark, if any; and

d) Lot number in code or otherwise to enable the batch of manufacture to be traced back from records.

3.2 BIS Certification Marking

The product may also be marked with Standard Mark.

3.2.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

4. SAMPLING

4.1 Preparation of Test Samples — Representative samples of the material shall be prepared as prescribed in Appendix B of IS : 505-1968*.

4.2 Number of Tests

4.2.1 Tests for the determination of loss on drying at 105 to 110°C, *p*H, grit, bulk density and fineness shall be conducted on each of the gross sample of the individual sub-lots.

4.2.2 Tests for the remaining characteristics given under Table 1 shall be carried out on the composite of the gross samples.

4.3 Criteria for Conformity

4.3.1 *For Individual Gross Sample of Sub-lots* — For declaring the conformity of the lot:

$\overline{X} + 0{\cdot}6\,R$ shall be less than or equal to the maximum specified requirements

$X - 0{\cdot}6\,R$ shall be greater than or equal to the minimum specified requirements

where

$\overline{X}$ = mean value of test results, and

R = range of results.

4.3.2 *For Composite Sample* — For declaring the conformity of the lot to the requirements of all the characteristics tested on the composite sample, the test results on the composite sample shall meet the corresponding requirements.

*Specification for light kaolin (*first revision*).

APPENDIX A

(*Clause* 2.2)

METHODS OF TEST FOR CHINA CLAY FOR EXPLOSIVE AND PYROTECHNIC INDUSTRY

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1960*) shall be employed in tests.

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

A-2. DETERMINATION OF LOSS ON DRYING

A-2.1 Procedure — Weigh accurately about 10 g of the material and heat in a squat weighing bottle at 105 to 110°C. Cool and weigh till a constant mass is obtained. Preserve the sample in a desiccator for subsequent tests.

A-2.2 Calculation

$$\text{Loss on drying, percent by mass} = \frac{100\,M}{M_1}$$

where

M = loss of mass in g, and

M_1 = mass in g of the material taken for the test.

A-3. DETERMINATION OF LOSS ON IGNITION

A-3.1 Procedure — Weigh accurately about 1 g of the material as dried in **A-2.1** in a porcelain or silica crucible. Ignite at about 900°C. Cool and weigh till constant mass is obtained.

A-3.2 Calculation

$$\text{Loss on ignition, percent by mass} = \frac{100\,M}{M_1}$$

where

M = loss of mass in g, and

M_1 = mass in g of the material taken for the test.

A-4. DETERMINATION OF MATTER SOLUBLE IN DILUTE HYDROCHLORIC ACID

A-4.1 Reagents

A-4.1.1 *Dilule Hydrochloric Acid* — approximately 0·2 N.

A-4.2 Procedure — Weigh accurately about 2 g of the material. Transfer to a round-bottom flask with 100 ml of hydrochloric acid. Fix up a reflux condenser and boil the material on a sand-bath for 5 minutes.

*Specification for water, distilled quality (*revised*).

Cool and filter through a sintered glass crucible No. G 4. Wash free from chlorides and evaporate the filtrate to dryness on a water-bath in a silica basin. After gentle heating, cool and weigh to a constant mass.

A-4.3 Calculation

$$\text{Matter soluble in hydrochloric acid, percent by mass} = \frac{100\ M}{M_1}$$

where

M = mass in g of residue, and

M_1 = mass in g of the material taken for the test.

A-5. DETERMINATION OF MATTER SOLUBLE IN WATER

A-5.1 Reagents

A-5.1.1 *Rectified Spirit — see* IS : 323-1959*.

A-5.1.2 *Bromophenol Blue Indicator Solution* — Dissolve 0·1 g of bromophenol blue in 100 ml of rectified spirit.

A-5.1.3 *Dilute Hydrochloric Acid* — approximately 0·1 N.

A-5.2 Procedure — Weigh accurately about 10 g of the material as dried in **A-2.1** in a 250-ml beaker. Add 5 ml of rectified spirit to wet the sample thoroughly. Add 200 ml of water, boil the suspension for 5 minutes and allow to cool to room temperature. Add sufficient bromophenol blue indicator to give a visible colour, and then add dilute hydrochloric acid until the blue colour disappears.

NOTE — Bromophenol blue turns yellow at about *p*H 4 at which point flocculation occurs and clear filtration is obtained.

A-5.2.1 Transfer the contents of the beaker to a 250-ml volumetric flask, dilute to the mark with water and mix well by shaking. Filter through a filter paper, rejecting the first 50 ml of filtrate. Place 100 ml of the clear filtrate into a tared porcelain dish and evaporate to dryness on a water-bath. Dry the residue at 105 ± 2°C, cool and weigh till constant mass is obtained.

A-5.3 Calculation

$$\text{Matter soluble in water, percent by mass} = 250 \times \frac{M_1}{M}$$

where

M_1 = mass in g of the residue obtained, and

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

*Specification for rectified spirit (*revised*).

A-6. DETERMINATION OF GRIT

A-6.0 Outline of the Method — The portion retained on 75-micron IS sieve is boiled with aqua regia. The insoluble residue obtained after digestion with aqua regia is dried. The dried residue is then sieved through 125-micron IS sieve and the portion retained on the sieve is weighed. If the residue (retained on 125-micron IS sieve) scratches soda glass then the mass previously obtained is expressed as percentage grit.

A-6.1 Apparatus

A-6.1.1 *Sieves* — 75-micron and 125-micron IS sieves.

A-6.1.2 *Glass Slides* — soda glass.

A-6.2 Reagents

A-6.2.1 *Aqua Regia* — prepared by mixing 3 volumes of concentrated hydrochloric acid and one volume of concentrated nitric acid.

A-6.3 Procedure

A-6.3.1 Sieve 100 g of the material through 75-micron IS sieve with 25-mm brush. Boil the portion retained on the sieve with about 50 ml aqua regia in a 150-ml beaker (covered with a watch-glass). Cool the beaker, dilute the acid with water and then decant the diluted acid carefully. Wash the residue remaining at the bottom of the beaker three times with water and dry the residue in an air-oven.

A-6.3.2 Sieve the dried residue carefully through 125-micron IS sieve with a light camel-hair brush. Weigh accurately the portion retained on the sieve and carry out with it the soda glass scratch test as described in **A-6.5**. If the residue scratches soda glass, express the mass (previously obtained) as percentage grit.

NOTE — Care should always be taken not to lose any material at any stage of the test.

A-6.4 Calculation

$$\text{Grit, percent by mass} = 100 \times \frac{M}{M_1}$$

where

M = mass in g of the residue scratching soda glass, and

M_1 = mass in g of the material taken for the test.

A-6.5 Soda Glass Scratch Test — Take a portion of the residue (retained on 125-micron IS sieve) in between the two clear glass slides and press the slides by hand along the length and breadth of the glass. See whether any scratch on the glass is obtained. If there is any scratch on the glass then the residue is termed as grit.

A-7. DETERMINATION OF FINENESS

A-7.1 Procedure — Place 25·0 g of the material, accurately weighed, on to a 63-micron IS sieve and wash the material on the sieve with water, gently brushing with a soft camel-hair brush, until the washings are clear. Dry the residue to constant mass at 100 ± 2°C.

A-7.2 Calculation

Fineness (material retained on 63-micron IS sieve), percent by mass $= 4\ M$

where

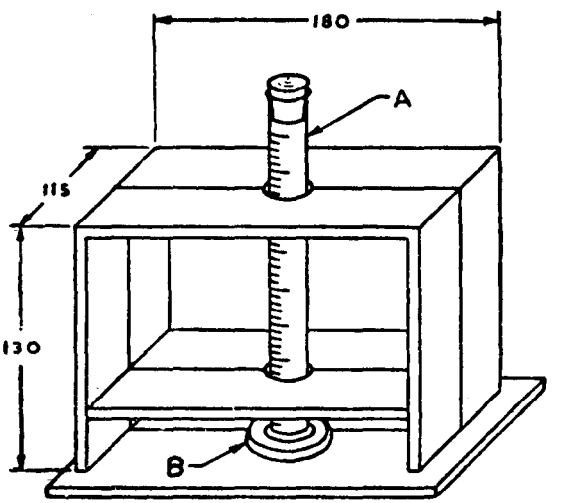
M = mass in g of the residue on the sieve.

A-8. DETERMINATION OF BULK DENSITY

A-8.1 Apparatus

A-8.1.1 Assemble the apparatus as shown in Fig. 1. The measuring cylinder *A* shall be of 250 ml capacity and shall conform to IS : 878-1956*. The base of the measuring cylinder shall be ground flat. The distance between the flat-ground part of the base of the measuring cylinder *A* and the rubber base pad *B*, when the measuring cylinder *A* is raised to the full height, shall be 25 ± 2 mm.

A-8.1.2 The rubber base pad *B* shall have a shore hardness of 42 to 50.



All dimensions in millimetres.

FIG. 1 APPARATUS FOR THE DETERMINATION OF BULK DENSITY

*Specification for measuring cylinders.

A-8.1.3 Pans of the balance shall be at least 10 cm in diameter and the balance shall be sensitive to less than 0·1 g.

A-8.2 Procedure — Place 50 g of the material in the graduated cylinder fitted in the apparatus and tap it until a constant volume of the material is obtained. Note down the volume of the material.

A-8.3 Calculation

$$\text{Bulk density, g/ml} = \frac{M}{V}$$

where

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

V = volume of the material in the cylinder.

A-9. DETERMINATION OF *p*H

A-9.1 Procedure — Weigh about 25 g of the material and transfer it to a 500-ml beaker. Add 100 ml of freshly boiled and cooled water. Allow to stand for 30 minutes with occasional stirring. Filter, reject the first 50 ml of the filtrate and collect the remaining filtrate in a beaker. Determine the *p*H of the solution by means of a suitable *p*H meter using glass electrode.

A-10. DETERMINATION OF OIL ABSORPTION

A-10.1 Procedure — Place about 2 g of dry material, accurately weighed, on a glazed porcelain, ground glass or marble plate. Add linseed oil (*see* IS : 75-1973*) from a weighed dropping bottle, drop by drop and regularly, each drop being mixed well with the material using a palette knife. Incorporate the oil thoroughly, in the course of 20 minutes, into the whole of the material with a palette knife, until the coherent mass is obtained. Weigh the dropping bottle again and determine by difference the mass of oil in grams. Where an approved sample is used for comparison, the oil absorption of the approved sample shall be determined by the same person and at the same time.

A-10.2 Calculation

$$\text{Oil absorption, ml per 100 g} = \frac{108\,M}{M_1}$$

where

M = mass in g of linseed oil absorbed, and

M_1 = mass in g of the dry material taken for the test.

*Specification for linseed oil, raw and refined (*second revision*).

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