INTERNATIONAL STANDARD

ISO 3628

Second edition
1994-05-01

Photography — Processing chemicals — Specifications for boric acid, granular

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Photographie — Produits chimiques pour traitement — Spécifications relatives à l'acide borique granulaire

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Foreword

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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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International Standard ISO 3628 was prepared by Technical Committee ISO/TC 42, *Photography*.

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This second edition cancels and replaces the first edition (ISO 3628:1976), which has been technically revised.

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Introduction

0.1 This International Standard is one of a series that establishes criteria of purity for chemicals used in processing photographic materials. General test methods and procedures cited in this International Standard are compiled in parts 1, 4 and 5 of ISO 10349.

This International Standard is intended for use by individuals with a working knowledge of analytical techniques, which may not always be the case. Some of the procedures utilize caustic, toxic or otherwise hazardous chemicals. Safe laboratory practice for the handling of chemicals requires the use of safety glasses or goggles, rubber gloves and other protective apparel such as face masks or aprons where appropriate. Normal precautions required in the performance of any chemical procedure are to be exercised at all times but care has been taken to provide warnings for hazardous materials. Hazard warnings designated by a letter enclosed in angle brackets, < >, are used as a reminder in those steps detailing handling operations and are defined in ISO 10349-1. More detailed information regarding hazards, handling and use of these chemicals may be available from the manufacturer.

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0.2 This International Standard provides chemical and physical requirements for the suitability of a photographic-grade chemical. The tests correlate with undesirable photographic effects. Purity requirements are set as low as possible consistent with these photographic effects. These criteria are considered the minimum requirements necessary to assure sufficient purity for use in photographic processing solutions, except that if the purity of a commonly available grade of chemical exceeds photographic processing requirements and if there is no economic penalty in its use, the purity requirements have been set to take advantage of the availability of the higher-quality material. Every effort has been made to keep the number of requirements to a minimum. Inert impurities are limited to amounts which will not unduly reduce the assay. All tests are performed on samples "as received" to reflect the condition of materials furnished for use. Although the ultimate criterion for suitability of such a chemical is its successful performance in an appropriate use test, the shorter, more economical test methods described in this International Standard are generally adequate.

Assay procedures have been included in all cases where a satisfactory method is available. An effective assay requirement serves not only as a safeguard of chemical purity but also as a valuable complement to the identity test. Identity tests have been included whenever a possibility exists that another chemical or mixture of chemicals could pass the other tests.

All requirements listed in clause 4 are mandatory. The physical appearance of the material and any footnotes are for general information only and are not part of the requirements.

0.3 Efforts have been made to employ tests which are capable of being run in any normally equipped laboratory and, wherever possible, to avoid tests which require highly specialized equipment or techniques. Instrumental methods have been specified only as alternative methods or alone in those cases where no other satisfactory method is available.

Over the past few years, great improvements have been made in instrumentation for various analyses. Where such techniques have equivalent or greater precision, they may be used in place of the tests described in this International Standard. Correlation of such alternative procedures with the given method is the responsibility of the user. In case of disagreement in results, the method called for in the specification shall prevail. Where a requirement states "to pass test", however, alternative methods shall not be used.

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Photography — Processing chemicals — Specifications for boric acid, granular

1 Scope

This International Standard establishes criteria for the purity of photographic-grade boric acid and describes the tests to be used to determine the purity.

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 10349-1:1992, *Photography — Photographic-grade chemicals — Test methods — Part 1: General.*

ISO 10349-4:1992, *Photography — Photographic-grade chemicals — Test methods — Part 4: Determination of residue after ignition.*

ISO 10349-5:1992, *Photography — Photographic-grade chemicals — Test methods — Part 5: Determination of heavy metals and iron content.*

3 General

3.1 Physical properties

Boric acid, H_3BO_3, is a white crystalline powder. It has a relative molecular mass of 61,83.

3.2 Hazardous properties

Boric acid is not hazardous when handled with normal precautions. Refer to the manufacturer for additional information.

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4 Requirements

A summary of the requirements is shown in table 1.

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5 Reagents and glassware

All reagents, materials and glassware shall conform to the requirements specified in ISO 10349-1 unless otherwise noted. The hazard warning symbols used as a reminder in those steps detailing handling operations are defined in ISO 10349-1. These symbols are used to provide information to the user and are not meant to provide conformance with hazardous labelling requirements as these vary from country to country.

6 Sampling

See ISO 10349-1.

Table 1 — Summary of requirements

Test	Limit	Subclause	International Standard in which test method is given
Assay (as H_3BO_3)	99,0 % (*m/m*) min.	7.1	ISO 3628
Residue after ignition	0,3 % (*m/m*) max.	7.2	ISO 10349-4
Heavy metals (as Pb)	0,002 % (*m/m*) max.	7.3	ISO 10349-5
Iron (Fe)	0,002 % (*m/m*) max.	7.4	ISO 10349-5
Appearance of solution	Clear and free from insoluble matter except for a slight flocculence	7.5	ISO 3628

NOTE — *m/m* = mass/mass

7 Test methods

7.1 Assay

7.1.1 Specification

Content of H_3BO_3 shall be 99,0 % (*m/m*) min.

7.1.2 Reagents

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7.1.2.1 Phenolphthalein indicator.

Dissolve 0,1 g of phenolphthalein in 50 ml of methanol or ethanol, then dilute to 100 ml with water.

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7.1.2.2 Sodium hydroxide, NaOH, standard volumetric solution of 1,0 mol/l (40,00 g/l)[1)2)], free of carbonate.

7.1.2.3 Mannitol.

7.1.3 Apparatus

7.1.3.1 Burette, of 50 ml capacity.

7.1.4 Procedure

Weigh, to the nearest 0,001 g, a test portion of 2,4 g to 2,6 g of sample in a weighing bottle. Dissolve the sample in approximately 50 ml of warm water. Add 15 g of mannitol (7.1.2.3), 6 drops of phenolphthalein indicator (7.1.2.1) and titrate with sodium hydroxide (7.1.2.2) to a pink endpoint.

7.1.5 Expression of results

The assay, expressed as a percentage by mass, is given by

$$6{,}183 \cdot c \cdot V / m$$

where

c is the actual concentration, in moles per litre, of the sodium hydroxide solution (7.1.2.2);

V is the volume, in millilitres, of the sodium hydroxide solution (7.1.2.2) needed to reach the titration endpoint;

m is the mass, in grams, of the test portion;

6,183 is the conversion factor of the equivalent mass of boric acid per mole of sodium hydroxide (i.e. 61,83) × the conversion factor for millilitres to litres (i.e. 0,001) × 100 (for percentage).

7.2 Residue after ignition

7.2.1 Specification

Maximum residue after ignition shall be 0,3 % (*m/m*).

1) Commercially available analysed reagent is recommended. If solutions are to be prepared, see any quantitative analytical chemistry text.

2) This solution may be prepared from sodium hydroxide (DANGER: << C >>).

7.2.2 Reagents

7.2.2.1 Methanol.

7.2.2.2 Hydrochloric acid (1 + 3)[3], (DANGER: < B >)[4].

7.2.2.3 Sulfuric acid (DANGER: << C >>), ρ = 1,84 g/ml (approximately).

7.2.3 Apparatus

7.2.3.1 Platinum crucible, of 50 ml capacity.

7.2.4 Procedure

Weigh, to the nearest 0,01 g, a test portion of approximately 2 g of the sample into the platinum crucible (7.2.3.1). Add 25 ml of methanol (7.2.2.1) and 5 drops of hydrochloric acid (7.2.2.2) (< B >). Evaporate to dryness on a steam bath in a fume cupboard. Add a further 15 ml of methanol and 3 drops of hydrochloric acid (7.2.2.2) and evaporate to dryness. Then add 2 to 3 drops of sulfuric acid (7.2.2.3) (<< C >>) and heat on a sand bath in a fume cupboard until the evolution of fumes ceases. Then continue with the incineration at 600 °C ± 50 °C for 4 h in accordance with sentence 2 of clause 7 of ISO 10349-4.

7.3 Heavy metals content

7.3.1 Specification

Maximum content of heavy metals shall be 0,002 % (*m/m*).

7.3.2 Procedure

NOTE 1 The standard for the iron test (7.4) is prepared in the same way as the heavy metals standard.

Determine the percentage of heavy metals in accordance with ISO 10349-5. Use a test portion of 1,90 g to 2,10 g prepared in accordance with ISO 10349-5:1992, 7.3. Use 4 ml of heavy metals standard prepared in accordance with ISO 10349-5:1992, 8.1.2. Due to the limited solubility of boric acid, use about 40 ml of warm water instead of 25 ml to dissolve the 2 g sample (see ISO 10349-5:1992, 7.2) and then dilute to the normal 50 ml (as in ISO 10349-5:1992, 8.2).

7.4 Iron content

7.4.1 Specification

Maximum content of iron shall be 0,002 % (*m/m*).

7.4.2 Procedure

Determine the percentage of iron in accordance with ISO 10349-5. Use a test portion of 1,90 g to 2,10 g prepared in accordance with ISO 10349-5:1992, 7.3. Use 4 ml of iron standard prepared in accordance with ISO 10349-5:1992, 8.1.2. Due to the limited solubility of boric acid dissolve the 2 g sample in about 40 ml of warm water instead of 25 ml and dilute to the normal 50 ml.

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7.5 Appearance of solution

7.5.1 Specification

The solution shall be clear and free from insoluble matter except for a slight flocculence.

7.5.2 Procedure

Dissolve a test portion of 50 g in 1 litre of water. If necessary, warm the solution slightly. Let this solution stand for 30 min at ambient temperature (20 °C to 27 °C). Observe the solution for colour and clarity.

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3) This solution may be prepared from hydrochloric acid, ρ = 1,18 g/ml (approximately) (DANGER: < C >< B >).

4) Hazard warning codes are defined in ISO 10349-1:1992, clause 4.

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