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ISO TC 45/SC 3~~/WG 2~~

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Secretariat: AFNOR

Natural rubber latex concentrate — Determination of total phosphate content by spectrophotometric method

Concentré de latex de caoutchouc naturel — Détermination de la teneur totale en phosphate par méthode spectrophotométrique

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Contents

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 documents 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~~www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see ~~www.iso.org/patents~~www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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~~www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 3, *Raw materials (including latex) for use in the rubber industry*.

This second edition cancels and replaces the first edition (ISO 19043:2015), which has been technically revised.

The main changes are as follows:

— the CAS numbers of the chemicals have been added;

— in 6.4, the requirement for potassium dihydrogen phosphate (stock solution) has been changed to include both the commercially available standard solution and the prepared one;

— in 7.1, "The difference between two readings" has been changed into "The difference between the results of duplicate determinations";

— in Clause 8, "Report the result as the mean of the duplicate determinations" has been added;

— in Annex A, the precision data have been updated by the results of an ITP evaluated in accordance with ISO 19983~~:2017~~.

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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~~www.iso.org/members.html.

Natural rubber latex concentrate — Determination of total phosphate content by spectrophotometric method

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices.

1 Scope

This document specifies a method for the determination of total phosphate content of natural rubber latex concentrate. This method is not necessarily suitable for latex from natural sources other than the *Hevea brasiliensis.*

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.

~~<std>ISO 124, *Latex, rubber — Determination of total solids content*</std>~~

~~<std>ISO 648, *Laboratory glassware — Single-volume pipettes*</std>~~

ISO 124, *Latex, rubber — Determination of total solids content*

ISO 648, *Laboratory glassware — Single-volume pipettes*

3 Terms and definitions

No terms and definitions are listed in this document.

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~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

4 Principle

Approximately 20 g of concentrated latex, of which the total solids content has been determined, is coagulated with hydrochloric acid (CAS 7647-01-0).

The coagulated latex is removed and the serum filtered through filter paper.

The residual phosphate present in a known volume of the serum is determined by measuring absorbance with a spectrophotometer at wavelength 470 nm.

5 Apparatus

5.1 Balance, accurate to 0,1 mg.

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5.2 Volumetric pipettes, of capacity 10 cm³ and 25 cm³, complying with the requirements of ISO 648, class A.

6 Reagents

Use reagents of recognized analytical grade and deionized water or water of equivalent purity.

6.1 Hydrochloric acid (CAS 7647-01-0), 370 g/kg.

6.2 Hydrochloric acid (CAS 7647-01-0) 1:24, mix 40 cm³ of 370 g/kg hydrochloric acid (6.1) with water and make up to 1 000 cm³.

6.3 Vanadate molybdate:

a) Dissolve 25 g ammonium molybdate (CAS 13106-76-8) in 300 cm³ water.

b) Dissolve 1,25 g ammonium metavanadate (CAS 7803-55-6) in 300 cm³ water. Heat to dissolve completely. Cool to room temperature before mixing with 330 cm³ of 370 g/kg hydrochloric acid (6.1) and leave to cool.

c) Mix solutions 6.3 a) and 6.3 b) and make up to 1 000 cm³ with water.

6.4 Potassium dihydrogen phosphate (CAS 7778-77-0) (stock solution) with a phosphorous concentration of 500 mg/dm³. Either use a commercially available standard solution or prepare as follows:

— Dissolve 2,196 8 g potassium dihydrogen phosphate and make up to 1 000 cm³ with water.

7 Procedure

7.1 General

Carry out the procedure in duplicate, using separate test portions obtained from the same homogenized sample. The difference between the results of duplicate determinations shall not exceed 30 mg/kg.

7.2 Determination of total solids content

Determine the total solids content of the concentrated latex in accordance with ISO 124.

7.3 Preparation of standard phosphate solutions

7.3.1 From the 500 mg/dm³ stock solution (6.4), pipette 0 cm³, 1 cm³, 2 cm³, 3 cm³, 4 cm³, 5 cm³, 10 cm³.

Then dilute with water and make up to 50 cm³ to make the first dilution of concentration 0 mg/dm³, 10 mg/dm³, 20 mg/dm³, 30 mg/dm³, 40 mg/dm³, 50 mg/dm³, 100 mg/dm³, respectively.

7.3.2 Pipette 10 cm³ of each solution (7.3.1) into 50 cm³ volumetric flasks.

Into each flask add 10 cm³ vanadate molybdate (6.3).

Then make up the volume to 50 cm³ with hydrochloric acid solution (6.2). The final concentration will be 0 mg/dm³, 2 mg/dm³, 4 mg/dm³, 6 mg/dm³, 8 mg/dm³,10 mg/dm³ and 20 mg/dm³.

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7.3.3 Leave the solutions (7.3.2) for 20 min and filter the total 50 cm³ solutions through an 8 µm pore size filter paper[1] and measure absorbance with a spectrophotometer at wavelength 470 nm. Measure in duplicate with different portions and take the average values.

Use 0 mg/dm³ solutions as a blank.

Prepare a calibration curve by plotting the concentration of potassium dihydrogen phosphate at 0 mg/dm³, 2 mg/dm³, 4 mg/dm³, 6 mg/dm³, 8 mg/dm³, 10 mg/dm³ and 20 mg/dm³ (7.3.2) against the absorbance. Determine the slope from the calibration curve (*S*).

7.4 Determination of phosphate content

Weigh about 20 g (m_0) of homogenous concentrated latex to the nearest 0,1 mg in a 100 cm³ beaker. Coagulate with 25 cm³ hydrochloric acid solution (6.2) and warm in water bath without stirring at 70 °C for 5 min to coagulate the latex completely.

Squeeze coagulum with a glass rod to obtain the serum as much as possible and filter the serum through the 8 µm pore size filter paper.

Pipette 10 cm³ of the filtered serum (V_1) into a 50 cm³ volumetric flask and add 10 cm³ of vanadate molybdate (6.3), then dilute with hydrochloric acid solution (6.2) to 50 cm³.

Wait for 20 min. Filter the solution through a filter paper.

Measure absorbance with a spectrophotometer at wavelength 470 nm against the blank (without latex).

8 Expression of results

The phosphate content, *P*, expressed in mg/kg, is calculated by Formula (1):

$$P = \frac{0{,}05 \times Abs \times V_0 \times 3{,}066\,1 \times 1\,000}{S \times m_1 \times V_1} \quad P = \frac{0{,}05 \times A \times V_0 \times 3{,}066\,1 \times 1\,000}{S \times m_1 \times V_1} \qquad (1)$$

where

*Abs*A is the absorbance with spectrophotometer at wavelength 470 nm;

V_0 is the volume, in cubic centimetres, of total serum calculated by Formula (2), assuming that the density of serum = 1 g/cm³;

S is the calibration curve slope versus the phosphate concentration;

m_1 is the mass, in gram, of the dried test portion calculated by Formula (3);

V_1 is the volume, in cubic centimetres, of serum pipetted from total serum to volumetric flask;

3,066 1 is the constant of conversion of P to PO_4^{3-}.

Report the result as the mean of the duplicate determinations.

$$V_0 = 25 + (m_0 - m_1) \qquad (2)$$

where m_0 is the mass of the test portion, in g.

[1] Whatman No.40 is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

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$$m_1 = \frac{m_0 \times TSC}{100} \quad m_1 = \frac{m_0 \times w_{TS}}{100} \qquad (3)$$

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where TSCw_{TS} is the total solids content, expressed as a percentage by mass, of the concentrated latex.

9 Precision data

See Annex A.

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10 Test report

The test report shall include the following:

a) a reference to this document, i.e. ISO 19043:—;:—:

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b) all details necessary for the identification of the sample;

c) all details necessary for the complete identification of the product tested;

d) the results and the units in which they have been expressed;

e) the date of the test;

f) any unusual features noted during the determination;

g) any operations not included in this document to which reference is made, as well as any incident which might have affected the results.