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SS-ISO 19984-1:2017

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Gummi och gummiprodukter – Bestämning av biobaserat innehåll – Del 1: Generella principer och beräkningsmetoder baserat på gummiblandningens sammansättning (ISO 19984-1:2017, IDT)

Rubber and rubber products – Determination of biobased content – Part 1: General principles and calculation methods using the formulation of the rubber compound (ISO 19984-1:2017, IDT)

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Den internationella standarden ISO 19984-1:2017 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 19984-1:2017.

The International Standard ISO 19984-1:2017 has the status of a Swedish Standard. This document contains the official version of ISO 19984-1:2017.

Denna standard är framtagen av kommittén för Gummi och gummiprodukter, SIS/TK 154.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

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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 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).

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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analysis*.

A list of all parts in the ISO 19984 series can be found on the ISO website.

Introduction

The use of biomass materials in rubber compounds helps to decrease the rubber industry's dependence on fossil resources. It is also expected to lead to a reduction of carbon dioxide emission, reducing global warming and promoting a sustainable global environment.

In the ISO 19984 series, biomass is the term used for the biological material from living or recently living organisms such as wood and agricultural waste materials.

Industrial scale biomass is now readily being grown from numerous types of plants sources and a variety of tree species. Biomass nowadays also includes plant or animal matter used for the production of fibres or chemicals. It may also include biodegradable wastes. Biomass excludes organic materials which have been transformed by geological processes into substances, such as petroleum or coal. Although fossil fuels have their origin in ancient biomass, they are not considered biomass by the generally accepted definition because they contain carbon that has been "out" of the modern carbon cycle.

The composition of biomass is mainly carbon, hydrogen and oxygen. Nitrogen and small quantities of other elements can also be found.

The ISO 19984 series specifies methods for the determination of the biobased content of rubber and rubber products. The results will give manufacturers and users a quantitative indication of their contribution to the preservation of the environment.

ISO 19984-1 specifies how to categorize constituents of rubber and rubber products and also how to calculate the biobased content using the compound formulation and the chemical structure of each constituent.

ISO 19984-2 specifies how to determine the biobased carbon content by radio chemical analyses, i.e. determination of ^{14}C. It can be obtained from the fraction of carbon atoms derived from biomass against the whole amount of carbon atoms in the rubber or rubber products. The methods specified in ISO 19984-2 allow consumers to determine the biobased carbon content even when the formulation of the rubber is unavailable.

ISO 19984-3 specifies how to separate rubber compounds into constituents, how to obtain each constituent's composition ratio and how to determine the biobased carbon content of each constituent by chemical analyses. Thus, the biobased mass content for each constituent can be derived and the biobased mass content for the whole rubber can be obtained by summing up all the constituent values.

Rubber and rubber products — Determination of biobased content —

Part 1:
General principles and calculation methods using the formulation of the rubber compound

1 Scope

This document specifies the general principles and the calculation methods for the determination of biobased content in rubber and rubber products, including polyurethanes, by using the compound formulation. These calculation methods are based on the mass or the carbon mass of each constituent present in the rubber or rubber product.

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 1382, *Rubber — Vocabulary*

ISO 19984-2, *Rubber and rubber products — Determination of biobased content —Part 2: Biobased carbon content*

ISO 19984-3, *Rubber and rubber products — Determination of biobased content —Part 3: Biobased mass content*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1382 and the following apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
radiocarbon
radioactive isotope of carbon, ^{14}C, having 8 neutrons, 6 protons and 6 electrons

3.2
biobased component
biobased part of a biobased constituent which is wholly or partly from biomass resource(s)

3.3
biobased content
amount of *biobased component(s)* (3.2) in a product expressed by carbon % to total carbon or mass % to total product mass

3.4
biobased carbon content
amount of *biobased component(s)* (3.2) in a product expressed by carbon % to total carbon

3.5
biobased mass content
amount of *biobased component(s)* (3.2) in a product expressed by mass % to total product mass

3.6
biomass
material of biological origin excluding material embedded in geological formations and/or fossilized

Note 1 to entry: For more detailed description, refer to the introduction of this document.

3.7
biobased natural rubber
cis-1,4-polyisoprene rubber obtained from botanical sources such as Hevea brasiliensis (Para rubber tree), Parthenium argentatum (guayule), Helianthus annuus (sunflower), Taraxacum kok-saghyz (Russian dandelion), etc.

Note 1 to entry: Epoxidized natural rubber and other types of modified natural rubbers are classified as biobased synthetic rubber for the purpose of calculation because these rubbers contain non-biomass resources.

3.8
biobased synthetic rubber
rubber obtained through chemical and/or biological process(es) wholly or partly from biomass resources

3.9
fossil-based synthetic rubber
rubber obtained through chemical process(es) wholly from fossil resources

3.10
biobased organic ingredient
organic compounding ingredient wholly or partly from biomass resources

3.11
fossil-based organic ingredient
organic compounding ingredient wholly from fossil resources

3.12
biobased inorganic ingredient
inorganic compounding ingredient wholly or partly from biomass resources

3.13
non-biobased inorganic ingredient
inorganic compounding ingredient wholly from resources which are not biomass

Note 1 to entry: Carbon blacks are classified as inorganic ingredient.

4 Principle

4.1 Identification indices for rubber or a rubber product to determine the biobased content

There are three indices used to identify the rubber or rubber product, namely,

a) the compound formulation,

b) the chemical composition of each constituent, and

c) the origin of the raw material.

There are three levels of condition depending on which identification information is available. The condition level determines the approach to be taken to determine the biobased content.

4.2 Condition level 1: when all (a), (b) and (c) are available

If a rubber product is under condition level 1, its biobased content can be obtained by calculation in accordance with this document.

4.3 Condition level 2: when (a) is available but (b) and/or (c) is unavailable

If a rubber product is under condition level 2, the biobased carbon content of the raw materials should be determined first by the ^{14}C determination methods specified in ISO 19984-2 or the chemical analysing methods specified in ISO 19984-3. Next, the biobased content of the whole compound can be derived proportionally to the mix ratio in accordance with this document, substituting the determined biobased content values into the compound formulation (a).

4.4 Condition level 3: none of (a), (b) nor (c) is available

When there is no available information about a rubber or a rubber product, the biobased content shall be determined either by ISO 19984-2 or ISO 19984-3. It should be noted and planned beforehand that the chemical analysing methods specified in ISO 19984-3 require to refer to ISO 19984-2 in order to determine the biobased carbon content.

4.5 Distinction between biobased carbon content and biobased mass content

Biobased carbon content and biobased mass content are different ways of expressing the biobased content.

NOTE The difference between the two indices, i.e. biobased carbon content and biobased mass content, is shown in Figure A.1.

4.6 Principle of determination of the biobased content by analyses

In order to determine the biobased content of rubber and rubber products, the radiocarbon ^{14}C concentration is measured in accordance with ISO 19984-2 and ISO 19984-3. The determination methods by analyses are based on the following principle.

The difference between biobased carbon and fossil-based carbon is the existence of ^{14}C, a radioactive isotope of carbon. The ratio of ^{14}C to ^{12}C in the atmosphere is constant and very low (1×10^{-12}). ^{14}C can be generated when ^{14}N is irradiated by cosmic radiation in the upper region of the atmosphere, and carbon dioxide having such ^{14}C eventually gets absorbed by plants by photosynthesis, so modern biomass contains ^{14}C at the constant rate stated above. In contrast, fossil-based carbons hardly include ^{14}C, since half-life of ^{14}C is 5 730 years and almost all of them have decayed during the long period of time spent underground. Therefore, the biobased content of rubber and rubber products can be determined by measuring ^{14}C present in them.

The mechanism of ^{14}C insertion into biobased products is shown in Figure B.1.

4.7 Outline of analyses and separation procedures for the determination of biobased contents

An outline of the separation procedures and analyses for the determination of biobased contents specified in the ISO 19984 series is shown in Figure 1.

ISO 19984-2 allows the determination of the biobased carbon content of rubber products without any separation procedures.