SLOVENSKI STANDARD
SIST EN 16766:2018

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Topila biološkega izvora - Zahteve in preskusne metode

Bio-based solvents - Requirements and test methods

Biobasierte Lösungsmittel - Anforderungen und Prüfverfahren

Solvants biosourcés - Exigences et méthodes d'essais

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English Version

Bio-based solvents - Requirements and test methods

Solvants biosourcés - Exigences et méthodes d'essais

Biobasierte Lösemittel - Anforderungen und Prüfverfahren

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 16766:2017) has been prepared by Technical Committee CEN/TC 411 “Bio-based products”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document supersedes CEN/TS 16766:2015.

M/491 [1] requested the development of European Standards for solvents and surfactants in relation to bio-based product aspects. This document has been prepared by CEN/TC 411/WG 2 “Bio based solvents”, the secretariat of which is held by the European Solvents Industry Group and NEN.

The following is a list of significant technical changes between this European Standard and the Technical Specification:

— introduction of the (final) publications on bio-based content determination, sustainability and life-cycle assessment developed under CEN/TC 411;

— change of the requirement that a bio-based solvent shall comply to similar sustainability criteria as comparable regular solvents towards an option, because this is very hard to determine for a solvents' producer and basically the task of the user;

— expanding the classification in Table 1 to fulfilling either bio-based carbon or bio-based content minima;

— further clarification of the sustainability requirements.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Bio-based products from forestry and agriculture have a long history of application, such as paper, board and various chemicals and materials. The last decades have seen the emergence of new bio-based products in the market. Some of the reasons for the increased interest lie in the bio-based products' benefits in relation to the depletion of fossil resources and climate change. Bio-based products may also provide additional product functionalities. This has triggered a wave of innovation with the development of knowledge and technologies allowing new transformation processes and product development.

Acknowledging the need for common standards for bio-based products, the European Commission issued mandate M/492[1)], resulting in a series of standards developed by CEN/TC 411, with a focus on bio-based products other than food, feed and biomass for energy applications.

The standards of CEN/TC 411 "Bio-based products" provide a common basis on the following aspects:

— common terminology;

— bio-based content determination;

— life Cycle Assessment (LCA);

— sustainability aspects;

— declaration tools.

It is important to understand what the term bio-based product covers and how it is being used. The term 'bio-based' means 'derived from biomass' [2]. Bio-based products (bottles, insulation materials, wood and wood products, paper, solvents, chemical intermediates, composite materials, etc.) are products which are wholly or partly derived from biomass. It is essential to characterize the amount of biomass contained in the product by for instance its bio-based content or bio-based carbon content.

The bio-based content of a product does not provide information on its environmental impact or sustainability, which may be assessed through LCA and sustainability criteria. In addition, transparent and unambiguous communication within bio-based value chains is facilitated by a harmonized framework for certification and declaration. This European Standard has been developed with the aim to fulfil part of a Mandate [1] to describe the technical requirements of bio-based solvents in relation to bio-based product aspects.

Solvents are liquids which have the ability to dissolve, suspend or extract other materials. In Europe, thousands of producers and manufacturers and more than 10 million workers use solvents every day. The solvent producing industry is composed of both small and medium-sized enterprises (SMEs) as well as multinationals. Downstream users generally tend to be SMEs and micro-SMEs.

Solvents are today mainly produced from fossil feedstock. There are efforts to replace these with solvents produced from renewable resources, i.e. bio-based solvents.

The criteria of the Regulation on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) [3] have been considered in the discussions that have led to this European Standard.

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1) A Mandate is a standardization task embedded in European trade laws. Mandate M/492 is addressed to the European Standardization bodies, CEN, CENELEC and ETSI, for the development of horizontal European Standards for bio-based products.

This document provides an approach that can be taken to describe the technical requirements of bio-based solvents in relation to bio-based product. The purpose of this document is to define how the criteria of performance, health, safety and environment can be determined (measured and calculated) for the bio-based solvent placed on the market. This approach intends to strengthen the reputation of "bio-based solvents" and customer confidence.

Future work by the solvents' industry is planned to enable a comparison between bio-based and fossil-based solvents they intend to replace in terms of the impact on the three pillars of sustainability as in EN 16751. This information is essential to check the sustainability impact of the use of all solvents over their whole life cycle.

This European Standard builds upon the horizontal standards on bio-based products developed by CEN/TC 411. It provides additional, product specific, details relevant for bio-based solvents.

1 Scope

This European Standard sets the requirements for bio-based solvents in terms of their bio-based content, their technical properties and test methods. It lays down the characteristics and details for assessment of bio-based solvents that:

— are fit for purpose in terms of performance related properties;

— comply with the health, safety and environmental requirements which apply generally to solvents; and

— are derived from biomass.

This European Standard specifies solvent classes, based on the percentage of bio-based carbon content and bio-based content.

NOTE EN 16575 defines the term “bio-based” as derived from biomass and clarifies that “bio-based” does not imply “biodegradable”. In addition, “biodegradable” does not necessarily imply the use of “bio-based” material.

In addition, this document sets requirements on information to be provided regarding sustainability aspects.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16640, *Bio-based products - Bio-based carbon content - Determination of the bio-based carbon content using the radiocarbon method*

EN 16575, *Bio-based products - Vocabulary*

EN 16751, *Bio-based products - Sustainability criteria*

EN 16760, *Bio-based products - Life Cycle Assessment*

EN 16785-1, *Bio-based products - Bio-based content - Part 1: Determination of the bio-based content using the radiocarbon analysis and elemental analysis*

prEN 16785-2:2016, *Bio-based products - Bio-based content - Part 2: Determination of the bio-based content using the material balance method*

EN 16848, *Bio-based products - Requirements for Business to Business communication of characteristics using a Data Sheet*

EN 16935, *Bio-based products - Requirements for Business-to-Consumer communication and claims*

EN ISO 12185, *Crude petroleum and petroleum products - Determination of density - Oscillating U-tube method (ISO 12185:1996)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16575 apply.

4 General information on the purpose of solvents

Solvents are liquids which have the ability to dissolve, suspend or extract other materials. They make it possible to process, apply, clean or separate materials. Solvents have significantly changed modern living and are an invaluable solution for industries as diverse as pharmaceuticals and microelectronics to domestic cleaning and printing. In fact, without solvents, many of the products we use and rely on, from penicillin to industrial paint, would not perform to the standards we demand today.

Organic solvents are any organic compound which is typically used, alone or in combination with other agents, and without undergoing a chemical change, to dissolve raw materials, products or waste materials.

Examples of applications for solvents are (as presented in the Solvents Emissions Directive [4]):

— cleaning agent;

— dissolver;

— dispersion medium;

— viscosity adjuster;

— surface tension adjuster;

— plasticiser; or

— preservative.

NOTE For more examples of applications, see the website of the European Solvents Industry Group, www.esig.org.

5 Performance

5.1 General

This clause gives a common set of technical properties characterizing the performance of solvents including bio-based solvents. In the absence of international solvent standardized specifications, it is necessary to provide to potential users the means to qualify bio-based solvents, especially in regard to their technical performance. There are also a number of other factors which will determine the acceptance of a solvent product, e.g. the Health, Safety and Environmental properties which are treated in Clause 6.

Solvents are used in a wide variety of applications and it is not convenient to evaluate their performance with respect to each application. Therefore, a practical approach is to define a set of measurable solvent properties which enable technical specialists to select appropriate solvents and guide their evaluation.

A set of seven properties (each under 5.2) has been selected which describe essential properties associated with a solvent.

5.2 Technical performance properties

5.2.1 Chemical composition

While chemical composition is not a property in itself, it provides essential information regarding the suitability of a solvent in process and applications.

Quantitative chemical composition of the product should be provided. To identify substances or mixtures as relevant use the nomenclature as in EU CLP [5].

5.2.2 Solvency power

Very different ways have been defined to measure solvency power, generally experimental measurements such as solubility in water, solubility in oil, Aniline point, Kauri Butanol index, polarity, etc. However, such methods are not able to describe the full extent of the solubility properties of products exhibiting a wide variety of polarities. Therefore, solvency power should be determined.

A well-known quantitative assessment of solvency power has been developed through the means of the Hansen Solubility parameters [6], which provide a suitable description of solvency properties. Annex A gives a detailed description on how to determine these solubility parameters.

Other scales may be used to characterize solvency power as for example the Kamlet-Taft parameters, as long as they are correlated to Hansen Solubility.

When determined, the source of the solubility parameter values shall be reported and whether they are estimated or determined experimentally.

5.2.3 Distillation characteristics

Numerous methods are available, based upon actual distillation measurements or on correlations, especially from gas chromatography.

NOTE Some formulations of solvents might not be suitable for actual distillation measurement, for example some emulsions.

A selection of recommended test methods is listed below:

— EN ISO 3405[7], which determines distillation characteristics at atmospheric pressure used for petroleum products of distillation points above 0 °C and end points below approximately 400 °C and is equivalent to ASTM D86 [8, 9].

— ISO 918 [10], which determines distillation characteristics of organic liquids used for non-petroleum products of boiling points in the range of approximately 30 °C to 300 °C in atmospheric conditions and which are stable under these conditions.

— ASTM D1078 [11], which is a test for the distillation range of volatile organic liquids used for distillation range of organic liquids boiling between 30 °C and 350 °C and which are stable during the distillation process.

— EN 15199-1 [12], describes the determination of boiling range distribution of materials with initial boiling points (IBP) above 100 °C and final boiling points (FBP) below 750 °C, it is equivalent to ASTM D5399 [13].

When reported, distillation characteristics of bio-based solvents shall be expressed by providing an initial boiling point and an end point (Dry Point or Final Boiling Point) expressed in °C with a reporting precision in compliance with the rules of the standard selected. The reference of the chosen test method standard shall also be reported.

5.2.4 Evaporation rate

The evaporation rate of a solvent is a useful indication of the speed at which a solvent will dry. Depending upon the type of solvent, different scales may be used. Three different methods are applicable to various solvent types: ASTM D1901 [14], ASTM D3539 [15] and DIN 53170 [16].

If the results of the determination of the evaporation rate are provided, this shall be done in accordance with the relevant test method standard. The reference of the chosen test method standard shall also be reported.

Such methods are used on a comparative basis against a reference volatile solvent such as Di-ethyl-ether or *n*-butyl-acetate. Another potentially useful property, related to the evaporation rate, is the vapour pressure measured or calculated at a specific temperature.

NOTE Vapour pressure is a property indicated in the EU REACH regulation Safety Data Sheet in Clause 9 [3].

The value of the vapour pressure may be provided in place of the evaporation rate. For an overview of test methodologies, see CEN/TR 16569 [17]. In that case, the value of the vapour pressure shall be indicated with a proper unit (e.g. Pa, kPa or mm Hg) and the temperature to which the value refers. A reference shall be indicated (i.e. measured or calculated).

5.2.5 Colour

Depending upon the type and intensity of the colour exhibited by the solvent, different scales are used. The following colour test methods and scales should be used:

a) For clear liquids, the Gardner colour scale as in EN ISO 4630 [18] or the Platinum-Cobalt scale as in EN ISO 6271 [19].

b) For petroleum type of liquids the Saybolt scale as determined via the chronometer method of ASTM D156 [20], the ASTM scale determined by using ASTM D1500 [21] or the more general techniques as in ASTM D6045 [22] (automatic tristimulus method).

Results of measure for the colour shall be provided in accordance with the relevant standard. The reference to the chosen test method standard shall also be reported.

5.2.6 Density

Density of solvents can vary significantly depending upon their chemical nature. Density provides useful information for the selection of suitable solvents for multiple applications.

EN ISO 12185 shall be used.

NOTE EN ISO 12185 is a method technically equivalent to ASTM D4052 [23].

Results of the determination of the density and the associated temperature shall be provided in accordance with EN ISO 12185. The reference to the test method standard shall be indicated also.

5.2.7 Kinematic viscosity

Viscosity measures the internal resistance to the flow exhibited by a fluid. Various measurement methods, direct or indirect are suitable for the determination of kinematic viscosity at 40 °C.

CAUTION — Some solvents have a boiling point below 40 °C. In that case, measurement at lower temperature shall be made, preferably at the temperature of use, and reported.