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Topila biološkega izvora - Zahteve in preskusne metode

Bio-based solvents - Requirements and test methods

Biobasierte Lösemittel - Anforderungen und Prüfverfahren

Solvants biosourcés - Exigences et méthodes d'essais

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Bio-based solvents - Requirements and test methods

Solvants biosourcés - Exigences et méthodes d'essais

Biobasierte Lösemittel - Anforderungen und Prüfverfahren

This draft Technical Specification is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 411.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (FprCEN/TS 16766:2014) has been prepared by Technical Committee CEN/TC 411 “Bio-based products”, the secretariat of which is held by NEN.

This document is currently submitted to the Formal Vote.

This document has been prepared under a Mandate M/491 [1] of the European Commission, addressed to CEN for the development of European standards for solvents and surfactants in relation to bio-based product aspects. It 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.

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' [3]. Bio-based products (bottles, insulation materials, wood and wood products, paper, solvents, chemical intermediates, composite materials, et cetera) 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 Technical Specification 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 as well as multinationals. Downstream users generally tend to be SME's and micro-SMEs.

Solvents are mainly produced from fossil feedstock. The amount of fossil feedstock used for solvent production is however low with less than 1 % of the total world's fossil feedstock consumption.

The approach which is published in this document is focused on the view of the customer: Are the referred criteria for "bio-based solvents" potentially provable for the formulated product? The purpose of this document is that every statement with regard to performance, health, safety and environment and bio-based content has to be determined (measured or calculated) for the solvent placed on the market. Finally, this approach intends to strengthen the reputation of "bio-based solvents" and the confidence of the customer in this product group.

The criteria for "bio-based solvents" published in this Technical Specification are complementary to the other, horizontal standards by CEN/TC 411.

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

1 Scope

This Technical Specification sets requirements for bio-based solvents in terms of properties, limits, application classes and test methods. It lays down the characteristics and details for assessment of bio-based solvents as to whether they:

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

- comply with the requirements regarding the health, safety and environment which apply to general solvents;

- are derived from a certain minimum percentage of biomass; and

- comply with at least similar sustainability criteria as comparable (regular) solvents.

The criteria of the Regulation for Environmental Assessment of Chemicals (REACh) [2] are included in the discussions that have lead to this paper.

NOTE prEN 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.

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 15199-1, *Petroleum products - Determination of boiling range distribution by gas chromatography method - Part 1: Middle distillates and lubricating base oils*

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

prEN 16575:2013, *Bio-based products - Vocabulary*

prEN 16751:2014, *Bio-based products — Sustainability criteria*

prEN 16760:2014, *Bio-based products — Life Cycle Assessment*

EN ISO 3104, *Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104)*

EN ISO 3405, *Petroleum products - Determination of distillation characteristics at atmospheric pressure (ISO 3405)*

EN ISO 6271-1, *Clear liquids - Estimation of colour by the platinum-cobalt scale - Part 1: Visual method (ISO 6271-1)*

EN ISO 6271-2, *Clear liquids - Estimation of colour by the platinum-cobalt scale - Part 2: Spectrophotometric method (ISO 6271-2)*

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

EN ISO 14040, *Environmental management - Life cycle assessment - Principles and framework (ISO 14040)*

EN ISO 14044, *Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044)*

ISO 918, *Volatile organic liquids for industrial use — Determination of distillation characteristics*

ISO 4630-1, *Clear liquids — Estimation of colour by the Gardner colour scale — Part 1: Visual method*

ISO 4630-2, *Clear liquids — Estimation of colour by the Gardner colour scale — Part 2: Spectrophotometric method*.

ASTM D156, *Standard Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)*

ASTM D1078, *Standard Test Method for Distillation Range of Volatile Organic Liquids*

ASTM D1500, *Standard Test Method for ASTM Color of Petroleum Products (ASTM Color scale)*

ASTM D1901, *Standard Test Method for Relative Evaporation Time of Halogenated Organic solvent and Their Admixtures.*

ASTM D3539, *Standard Test Methods for the Evaporation Rates of Volatile Liquids by Shell Thin-Ffilm Evaporometer.*

ASTM D6045, *Standard Test Method for Color of Petroleum Products by the Automatic Tristimulus Method*

ASTM D7042, *Standard Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)*

DIN 53170, *Solvents for prints and varnishes - Determination of the Evaporation Rate.*

3 Terms and definitions

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

4 General 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 Generalities around performance

This section gives a common set of technical properties characterizing the performance of solvents including bio-based solvents, In absence of international solvent specification standards, it is necessary to provide to potential users the means to qualify the bio-based solvent products, especially for its technical performance. There are a number of other factors which will determine the acceptance of a solvent product such as the Health, Safety and Environmental properties which are treated in another section of this document.

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 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 of the nomenclature as in EU CLP [5] shall be used.

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.

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 this solubility parameters.

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

Values of the three Hansen solubility parameters shall be given and should be reported to one decimal place and in units of $MPa^{1/2}$.

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

5.2.3 Distillation characteristics

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

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

A selection of recommended test methods is listed here below.