INTERNATIONAL STANDARD

ISO 4716

Third edition
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Essential oil of vetiver [*Chrysopogon zizanioides* (L.) Roberty, syn. *Vetiveria zizanioides* (L.) Nash]

*Huile essentielle de vétiver [*Chrysopogon zizanioides *(L.) Roberty, syn.* Vetiveria zizanioides *(L.) Nash]*

Reference number
ISO 4716:2013(E)

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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, www.iso.org/directives.

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The committee responsible for this document is ISO/TC 54, *Essential oils*.

This third edition cancels and replaces the second edition (ISO 4716:2002), which has been technically revised.

Essential oil of vetiver [*Chrysopogon zizanioides* (L.) Roberty, syn. *Vetiveria zizanioides* (L.) Nash]

1 Scope

This International Standard specifies certain characteristics of the essential oil of vetiver [*Chrysopogon zizanioides* (L.) Roberty, syn. *Vetiveria zizanioides* (L.) Nash], growing in Reunion Island, China, Haiti, Indonesia, Madagascar, Brazil, and Comoros Island in order to facilitate assessment of its quality.

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.

ISO/TR 210, *Essential oils — General rules for packaging, conditioning and storage*

ISO/TR 211, *Essential oils — General rules for labelling and marking of containers*

ISO 212, *Essential oils — Sampling*

ISO 279, *Essential oils — Determination of relative density at 20 °C — Reference method*

ISO 280, *Essential oils — Determination of refractive index*

ISO 592, *Essential oils — Determination of optical rotation*

ISO 875, *Essential oils — Evaluation of miscibility in ethanol*

ISO 1242, *Essential oils — Determination of acid value*

ISO 11024 (all parts), *Essential oils — General guidance on chromatographic profiles*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
essential oil of vetiver
essential oil obtained by steam distillation of the roots of *Chrysopogon zizanioides* (L.) Roberty, syn. *Vetiveria zizanioides* (L.) Nash of the Poaceae family

Note 1 to entry: For information on the CAS number, see ISO/TR 21092.[2]

4 Requirements

4.1 Appearance

Viscous liquid.

4.2 Colour

From yellowish brown to reddish brown.

4.3 Odour

Characteristic, woody and earthy.

4.4 Relative density at 20 °C, d_{20}^{20}

Value	Bourbon type[a]	China	Haiti	Indonesia	Brazil
Minimum	0,990	0,985	0,980	0,980	0,990
Maximum	1,015	1,020	1,005	1,003	1,010
[a] Bourbon type includes: Reunion Island, Comoros Island and Madagascar origins.					

4.5 Refractive index at 20 °C

Value	Bourbon type[a]	China	Haiti	Indonesia	Brazil
Minimum	1,522	1,520	1,516	1,520	1,520
Maximum	1,530	1,528	1,527	1,530	1,530
[a] Bourbon type includes: Reunion Island, Comoros Island and Madagascar origins.					

4.6 Optical rotation at 20 °C

Value	Bourbon type[a]	China	Haiti	Indonesia	Brazil
Minimum	+19°	+17°	+22°	+17°	+15°
Maximum	+30°	+46°	+48°	+32°	+30°
[a] Bourbon type includes: Reunion Island, Comoros Island and Madagascar origins.					

4.7 Miscibility in ethanol 80 % volume fraction at 20 °C

It shall not be necessary to use more than 2 volumes of ethanol 80 % volume fraction to obtain a clear solution with 1 volume of essential oil.

NOTE A slight opalescence can sometimes be observed.

4.8 Acid value

Value	Bourbon type[a]	China	Haiti	Indonesia	Brazil
Minimum	4,5	10	1	10	30
Maximum	35	70	6	35	60
[a] Bourbon type includes: Reunion Island, Comoros Island and Madagascar origins.					

4.9 Chromatographic profile

Carry out the analysis of the essential oil by gas chromatography. Identify in the chromatogram obtained the representative and characteristic components shown in Table 1. The proportions of these components, indicated by the integrator, shall be as shown in Table 1. This constitutes the chromatographic profile of the essential oil.

Important — Due to the viscosity of this essential oil, it is necessary to dilute it with 1,8-cineole so that the final mass fraction of each component in the mixture is 50 %. It is also recommended to use a polyethylene glycol type polar column. There will be two integrations, with and without 1,8-cineole.

Table 1 — Chromatographic profile

Component	Bourbon type[a]		China		Haiti		Indonesia		Brazil	
	min. %	max. %	min. %	max. %	min. %	max. %	min. %	max. %	min. %	max. %
β-Vetivenene	3	6	2	8	0,7	3	4	9	6	9
β-Vetivone	2	5	2	4	2	4	2	4	2	4
Khusimol	12	18	5	15	9	15	6	11	8	13
α-Vetivone	3	6	2	5	2	4	2	4	1	4
Isovalencenol	6	14	1	11	10	16	1	7	5	11
The above percentages are obtained without integration of 1,8-cineole.										
1,8-Cineole	<53		<53		<53		<53		<53	

NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.

[a] Bourbon type includes: Reunion Island, Comoros Island, and Madagascar origins.

4.10 Flashpoint

Information on the flashpoint is given in Annex B.

5 Sampling

Sampling shall be performed in accordance with ISO 212.

Minimum volume of test sample: 25 ml.

NOTE This volume allows each of the tests specified in this International Standard to be carried out at least once.

6 Test methods

6.1 Relative density at 20 °C, d_{20}^{20}

Determine the relative density in accordance with ISO 279.

6.2 Refractive index at 20 °C

Determine the refractive index in accordance with ISO 280.

6.3 Optical rotation at 20 °C

Determine the optical rotation in accordance with ISO 592 on a 10 % solution in ethanol 95 % volume fraction.

6.4 Miscibility in ethanol 80 % volume fraction at 20 °C

Determine the miscibility in accordance with ISO 875.

6.5 Acid value

Determine the acid value in accordance with ISO 1242.

6.6 Chromatographic profile

Determine the chromatographic profile in accordance with ISO 11024.

7 Packaging, labelling, marking and storage

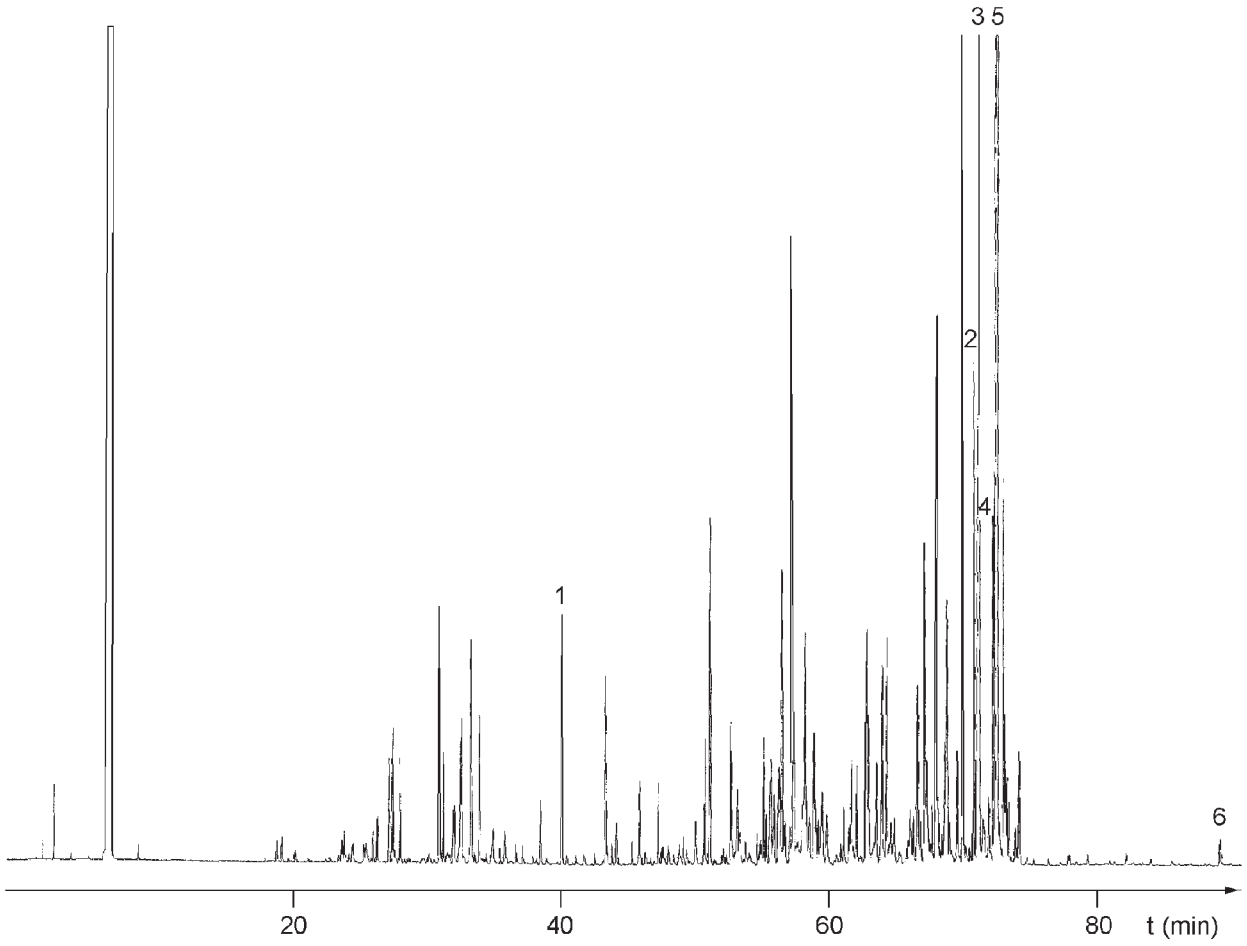
These items shall be in accordance with ISO/TR 210 and ISO/TR 211.

Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of vetiver [*Chrysopogon zizanioides* (L.) Roberty, syn. *Vetiveria zizanioides* (L.) Nash]

A.1 Essential oil of vetiver, Haiti

Figure A.1 is a typical chromatogram of the analysis of the essential oil of vetiver, Haiti, diluted with 1,8-cineole so that the final mass fraction of each component in the mixture is 50 %.



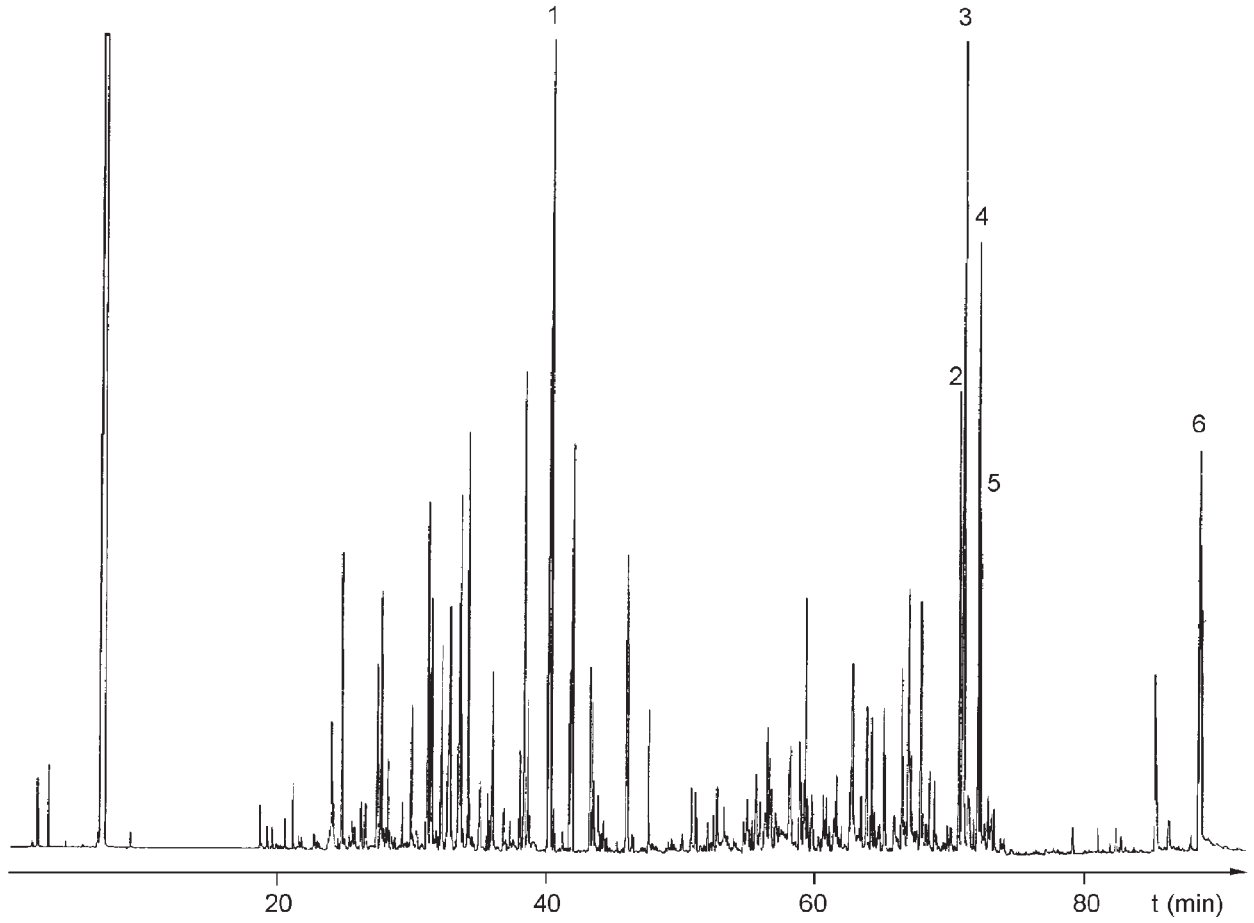
Peak identification		Operating conditions
1	β-Vetivenene	Column: capillary; 50 m long; 0,2 mm internal diameter
2	β-Vetivone	Stationary phase: polyethylene glycol 20M[a]
3	Khusimol	Film thickness: 0,25 µm
4	α-Vetivone	Oven temperature: programming from 65 °C to 230 °C, at a rate of 2 °C/min
5	Isovalencenol	Injector temperature: 250 °C
6	Zizanoic acid	Detector temperature: 250 °C
		Detector: flame ionization type
		Carrier gas: Hydrogen
		Volume injected: 0,2 µl
t	time	Carrier gas flow rate: 1,1 ml/min
		Split ratio: 1/100

[a] 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.

Figure A.1 — Typical chromatogram taken on a polar column

A.2 Essential oil of vetiver, Indonesia

Figure A.2 is a typical chromatogram of the analysis of the essential oil of vetiver, Indonesia, diluted with 1,8-cineole so that the final mass fraction of each component in the mixture is 50 %.



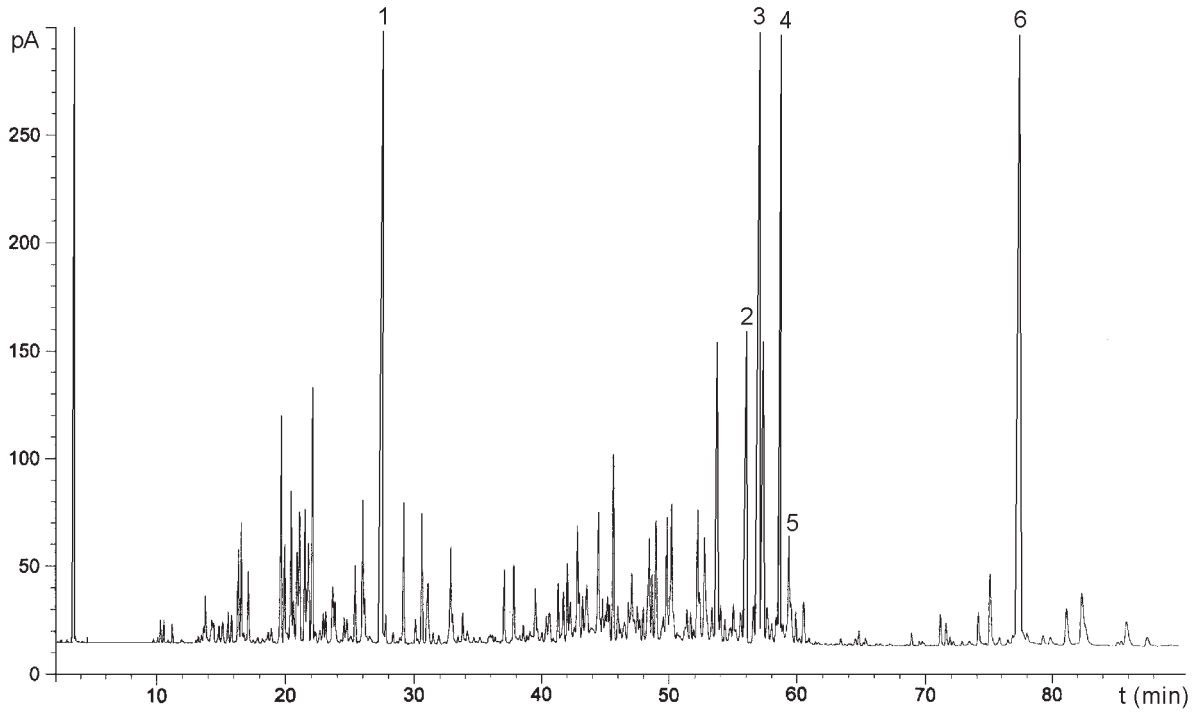
Peak identification		Operating conditions
1	β-Vetivenene	Column: capillary; 50 m long; 0,2 mm internal diameter
2	β-Vetivone	Stationary phase: polyethylene glycol 20M[a]
3	Khusimol	Film thickness: 0,25 µm
4	α-Vetivone	Oven temperature: programming from 65 °C to 230 °C, at a rate of 2 °C/min
5	Isovalencenol	Injector temperature: 250 °C
6	Zizanoic acid	Detector temperature: 250 °C
		Detector: flame ionization type
		Carrier gas: Hydrogen
		Volume injected: 0,2 µl
t	time	Carrier gas flow rate: 1,1 ml/min
		Split ratio: 1/100

[a] 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.

Figure A.2 — Typical chromatogram taken on a polar column

A.3 Essential oil of vetiver, Brazil

Figure A.3 is a typical chromatogram of the analysis of the essential oil of vetiver, Brazil, diluted with 1,8-cineole so that the final mass fraction of each component in the mixture is 50 %.

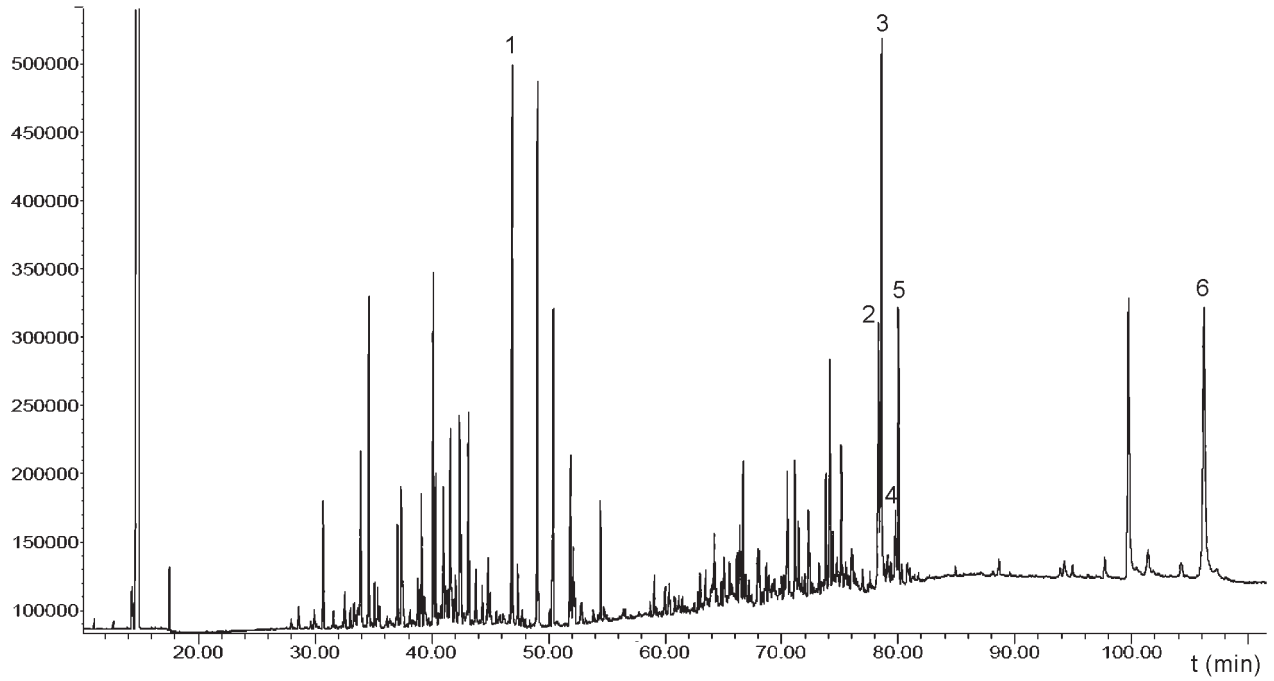


Peak identification		Operating conditions
1	β-Vetivenene	Column: capillary; 30 m long; 0,32 mm internal diameter
2	β-Vetivone	Stationary phase: polyethylene glycol
3	Khusimol	Film thickness: 0,25 µm
4	α-Vetivone	Oven temperature: programming from 65 °C to 210 °C, at a rate of 2 °C/min
5	Isovalencenol	Injector temperature: 250 °C
6	Zizanoic acid	Detector temperature: 250 °C
		Detector: flame ionization type
		Carrier gas: Helium
		Volume injected: 0,2 µl
t	time	Carrier gas flow rate: 3,3 ml/min
		Split ratio: 1/50

Figure A.3 — Typical chromatogram taken on a polar column

A.4 Essential oil of vetiver, China

Figure A.4 is a typical chromatogram of the analysis of the essential oil of vetiver, China, diluted with 1,8-cineole so that the final mass fraction of each component in the mixture is 50 %.



Peak identification		Operating conditions
1	β-Vetivenene	Column: capillary; 60 m long; 0,25 mm internal diameter
2	β-Vetivone	Stationary phase: polyethylene glycol
3	Khusimol	Film thickness: 0,25 µm
4	α-Vetivone	Oven temperature: programming from 65 °C to 230 °C, at a rate of 2 °C/min
5	Isovalencenol	Injector temperature: 250 °C
6	Zizanoic acid	Detector temperature: 250 °C
		Detector: flame ionization type
		Carrier gas: Helium
		Volume infected: 0,2 µl
t	time	Carrier gas flow rate: 1,0 ml/min
		Split ratio: 1/100

Figure A.4 — Typical chromatogram taken on a polar column

Annex B
(informative)

Flashpoint

B.1 General information

For safety reasons, transport companies, insurance companies, and people in charge of safety services require information on the flashpoints of essential oils, which in most cases are flammable products.

A comparative study on the relevant methods of analysis (see ISO/TR 11018[1]) concluded that it was difficult to recommend a single apparatus for standardization purposes, given that:

— there is a wide variation in the chemical composition of essential oils;

— the volume of the sample needed in certain requirements would be too costly for high-priced essential oils;

— as there are several different types of equipment which can be used for the determination, users cannot be expected to use one specified type only.

Consequently, it was decided to give a mean value for the flashpoint annexed to each International Standard, for information, in order to meet the requirements of the interested parties.

The equipment with which this value was obtained has to be specified.

For further information see ISO/TR 11018.[1]

B.2 Flashpoint of the essential oil of vetiver (all origins)

The mean value is + 100 °C.

NOTE Obtained with Setaflash[1)] equipment.

1) Equipment 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.

Bibliography

[1] ISO/TR 11018:1997, *Essential oils — General guidance on the determination of flashpoint*

[2] ISO/TR 21092, *Essential oils — Characterization*

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