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Essential oil of ginger [*Zingiber officinale* Roscoe]

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National foreword

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INTERNATIONAL STANDARD

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Essential oil of ginger [*Zingiber officinale* Roscoe]

*Huile essentielle de gingembre [*Zingiber officinale *Roscoe]*

Reference number
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Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
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Contents

Page

Foreword

Foreword

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

Essential oil of ginger [*Zingiber officinale* Roscoe]

1 Scope

This International Standard specifies certain characteristics of the essential oil of ginger (*Zingiber officinale* Roscoe) cultivated in China, India and West Africa, 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 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 ginger
essential oil obtained by steam distillation of the rhizome of *Zingiber officinale* Roscoe of the *Zingiberaceae* family, cultivated principally in China, India and West Africa

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

4 Requirements

4.1 Appearance

Clear mobile liquid.

4.2 Colour

China	India	West Africa
Pale yellow to amber	Yellow	Pale yellow to yellow

4.3 Odour

Characteristic of ginger rhizome, with spicy, peppered, lemony odour.

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

Value	China	India	West Africa
Minimum	0,873	0,872	0,872
Maximum	0,885	0,890	0,892

4.5 Refractive index at 20 °C

Value	China	India	West Africa
Minimum	1,486	1,484	1,486
Maximum	1,495	1,498	1,496

4.6 Optical rotation at 20 °C

China	India	West Africa
Between −47° and −26°	Between −50° and −27°	Between −47° and −18°

4.7 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.

Table 1 — Chromatographic profile

Component	China		India		West Africa	
	Minimum %	Maximum %	Minimum %	Maximum %	Minimum %	Maximum %
α-Pinene	1,5	2,5	2,0	6,0	0,1	3,0
Camphene	4,5	10,0	5,0	8,0	0,2	12,0
Neral	n.d.[a]	0,5	0,1	0,4	0,2	2,0
Geraniol	0,1	1,0	0,1	0,6	0,1	3,5
Geranial	n.d.[a]	0,6	0,1	0,6	0,5	3,5
β-Elemene	0,5	1,5	0,6	1,1	n.d.[a]	1,0
ar-Curcumene	5,0	11,0	6,5	9,0	3,0	11,0
α-Zingiberene	29,0	40,0	35,0	40,0	23,0	45,0
β-Bisabolene	2,5	9,0	2,5	5,5	3,0	7,0
β-Sesquiphellandrene	10,0	14,0	11,5	13,5	8,0	17,0
NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A.						
[a] Not detected.						

4.8 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: 30 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.

6.4 Chromatographic profile

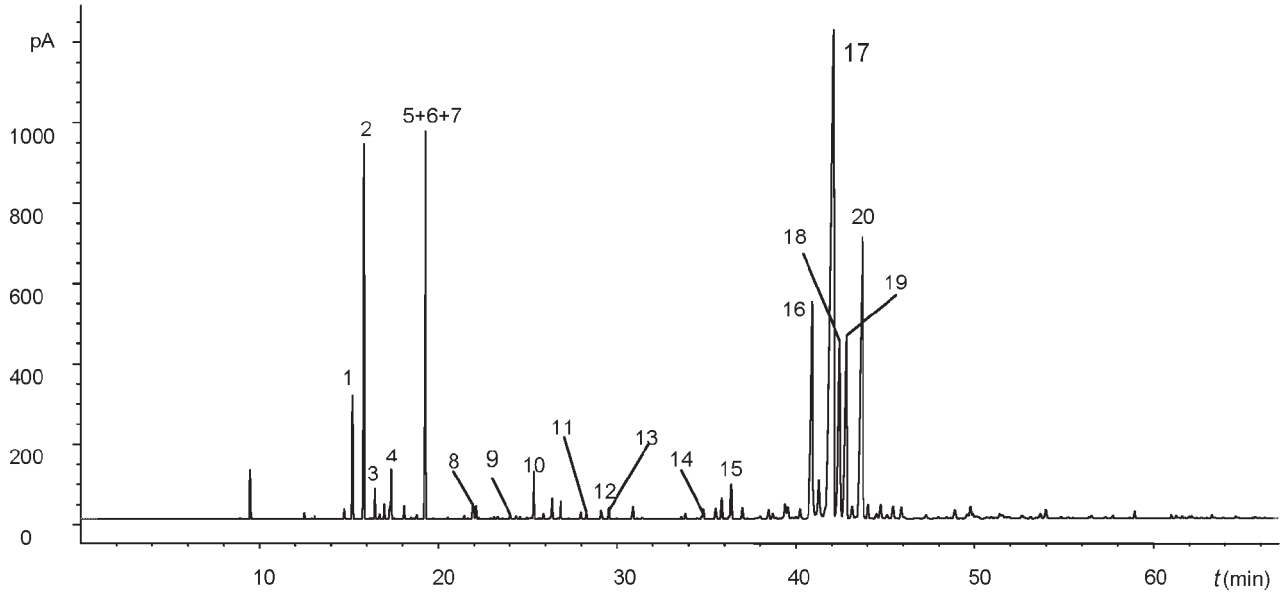
Determine the chromatographic profile in accordance with ISO 11024.

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 ginger (*Zingiber officinale* Roscoe)

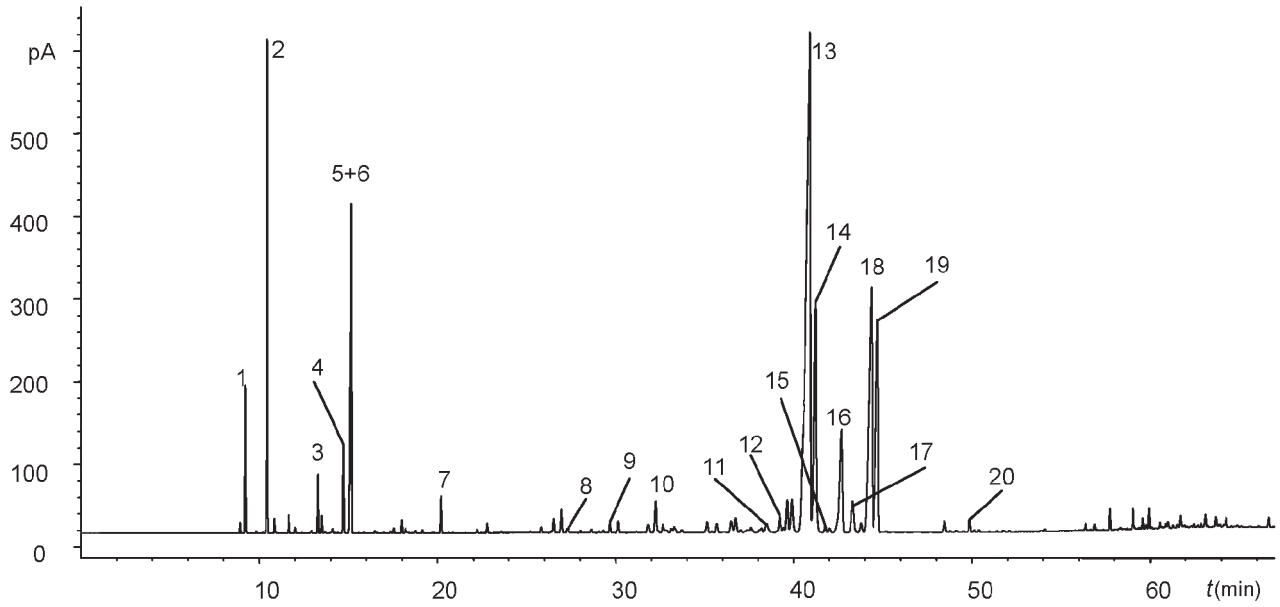


Key

Peak identification		**Operating conditions**
1	α-Pinene	Column: capillary, fused silica; length 60 m; internal diameter 0,25 mm
2	Camphene	Stationary phase: polydimethy siloxane (DB-1)[a]
3	Methyl heptenone	Film thickness: 0,25 µm
4	β-Myrcene	Oven temperature: isothermal at 60 °C for 2 min, then temperature programming from 60 °C to 150 °C at a rate of 3 °C/min, temperature programming from 150 °C to 180 °C at a rate of 1 °C/min, temperature programming from 180 °C to 220 °C at a rate of 5 °C/min, isothermal at 220 °C for 5 min
5+6+7	Limonene + 1,8-Cineole + β-phellandrene	Injector temperature: 250 °C
8	Linalool	Detector temperature: 250 °C
9	Camphor	Detector: flame ionization type
10	Borneol	Carrier gas: nitrogen
11	Neral	Volume injected: 0,2 µl
12	Geraniol	Carrier gas flow rate: 1 ml/min
13	Geranial	Split ratio: 1/100
14	Geranyl acetate	
15	β-Elemene	
16	ar-Curcumene	*t* time
17	α-Zingiberene	
18	α-Farnesene	
19	β-Bisabolene	
20	β-Sesquiphellandrene	

[a] 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.

Figure A.1 — Typical chromatogram taken on an apolar column for essential oil of ginger, produced in China



Key

Peak identification	
1	α-Pinene
2	Camphene
3	β-Myrcene
4	Limonene
5+6	1,8-Cineole + β-phellandrene
7	Methyl heptenone
8	Camphor
9	Linalool
10	β-Elemene
11	Neral
12	Borneol
13	α-Zingiberene
14	β-Bisabolene
15	Geranial
16	α-Farnesene
17	Geranyl acetate
18	β-Sesquiphellandrene
19	ar-Curcumene
20	Geraniol

Operating conditions

Column: capillary, fused silica; length 60 m; internal diameter 0,25 mm

Stationary phase: polyethylene glycol (Innowax 20 M)[a]

Film thickness: 0,25 µm

Oven temperature: isothermal at 60 °C for 2 min, then temperature programming from 60 °C to 120 °C at a rate of 3 °C/min, temperature programming from 120 °C to 145 °C at a rate of 1 °C/min, temperature programming from 145 °C to 220 °C at a rate of 5 °C/min, isothermal at 220 °C for 5 min

Injector temperature: 250 °C

Detector temperature: 250 °C

Detector: flame ionization type

Carrier gas: helium

Volume injected: 0,2 µl

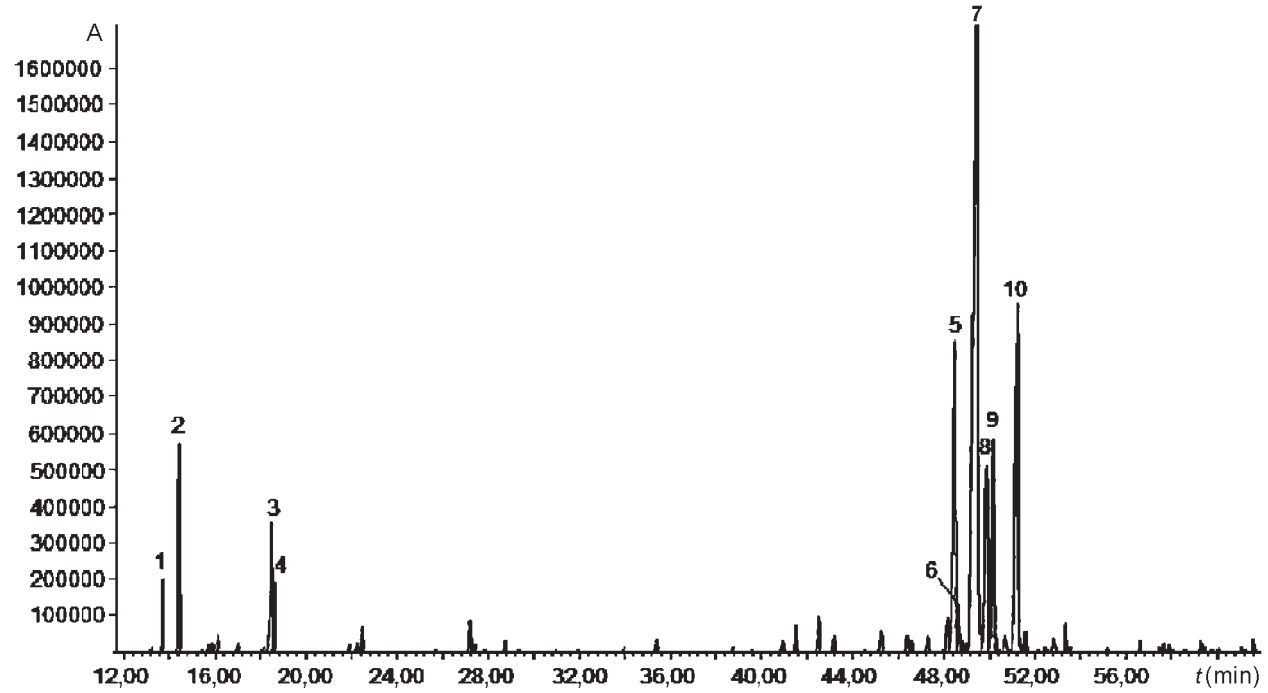
Carrier gas flow rate: 1 ml/min

Split ratio: 1/100

t time

[a] 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.

Figure A.2 — Typical chromatogram taken on a polar column for essential oil of ginger, produced in China

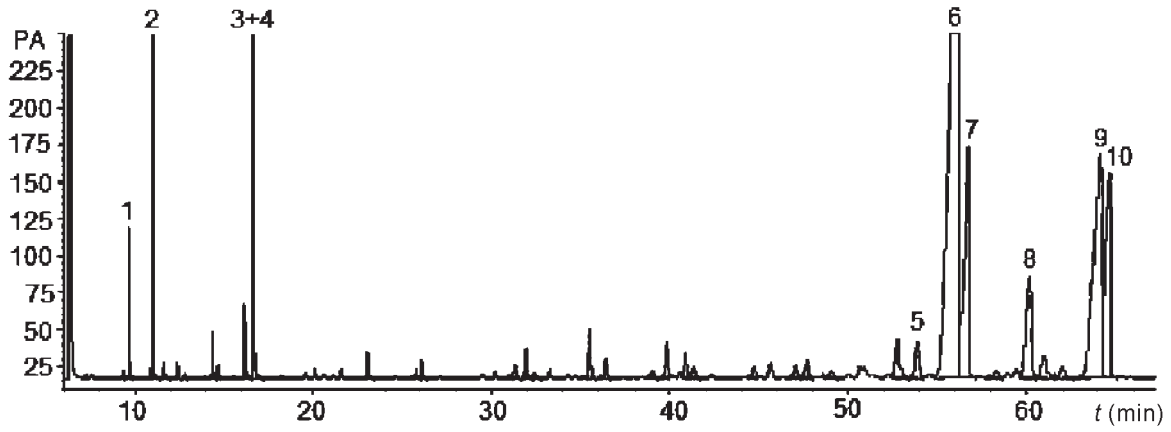


Key

Peak identification		**Operating conditions**
1	α-Pinene	Column: capillary, fused silica; length 60 m
2	Camphene	Stationary phase: methyl polysiloxane (DB-5)[a]
3	β-Phellandrene	Oven temperature: temperature programming from 70 °C to 270 °C at a rate of 2 °C/min
4	1,8-Cineole	Injector temperature: 280 °C
5	ar-Curcumene	Detector temperature: 280 °C
6	Germacrene D	Detector: flame ionization type
7	α-Zingiberene	Carrier gas: helium
8	α-Farnesene	
9	β-Bisabolene	*t* time
10	β-Sesquiphellandrene	

[a] 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.

Figure A.3 — Typical chromatogram taken on an apolar column for essential oil of ginger, produced in India



Key

Peak identification	
1	α-Pinene
2	Camphene
3+4	β-Phellandrene + 1,8-Cineole
5	Germacrene D
6	α-Zingiberene
7	β-Bisabolene
8	α-Farnesene
9	β-Sesquiphellandrene
10	ar-Curcumene

Operating conditions

Column: capillary, fused silica; length 60 m

Stationary phase: polyethylene glycol (Carbowax)[a]

Oven temperature: isothermal at 60 °C for 2 min, then temperature programming from 60 °C to 120 °C at a rate of 2,5 °C/min, temperature programming from 120 °C to 130 °C at a rate of 0,1 °C/min, temperature programming from 130 °C to 220 °C at a rate of 8 °C/min, isothermal at 220 °C for 20 min

Injector temperature: 240 °C

Detector temperature: 240 °C

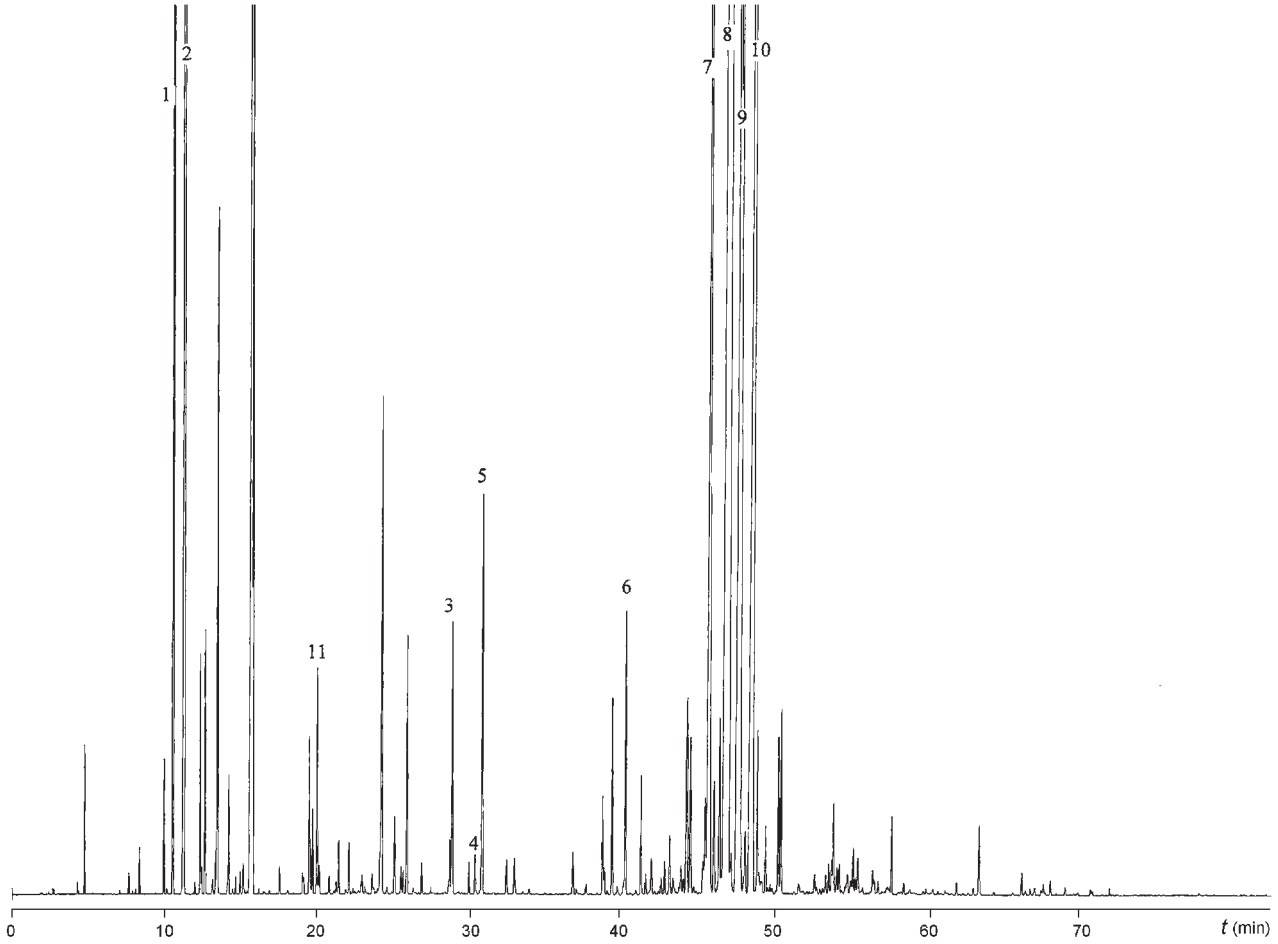
Detector: flame ionization type

Carrier gas: helium

t time

[a] 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.

Figure A.4 — Typical chromatogram taken on a polar column for essential oil of ginger, produced in India



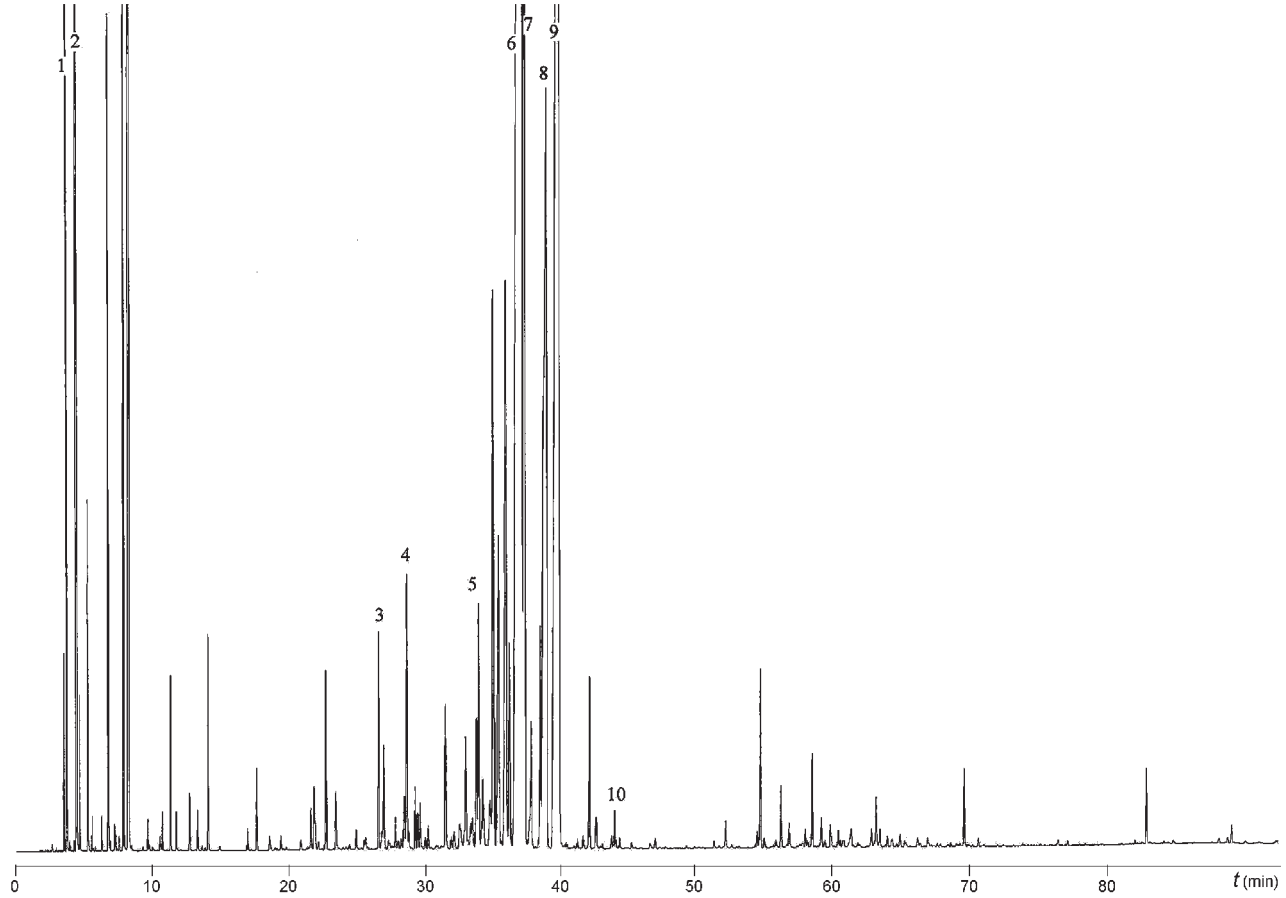
Key

Peak identification		**Operating conditions**
1	α-Pinene	Column: capillary, fused silica; length 50 m; internal diameter 0,22 mm
2	Camphene	Stationary phase: dimethyl polysiloxane (BP 1)[a]
3	Neral	Film thickness: 0,25 µm
4	Geraniol	Oven temperature: isothermal at 65 °C for 5 min, then temperature programming from 65 °C to 185 °C at a rate of 2°C/min, temperature programming from 185 °C to 230 °C at a rate of 3 °C/min, isothermal at 230 °C for 35 min
5	Geranial	
6	β-Elemene	
7	ar-Curcumene	Injector temperature: 230 °C
8	α-Zingiberene	Detector temperature: 250 °C
9	β-Bisabolene + α-Farnesene	Detector: flame ionization type
10	β-Sesquiphellandrene	Carrier gas: hydrogen
11	Linalool	Volume injected: 0,2 µl
		Pre-column pressure: 152 KPa
		Split ratio: 1/100

t time

[a] 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.

Figure A.5 — Typical chromatogram taken on an apolar column for essential oil of ginger, produced in West Africa



Key

Peak identification		**Operating conditions**
1	α-Pinene	Column: capillary, fused silica; length 50 m; internal diameter 0,22 mm
2	Camphene	Stationary phase: polyethylene glycol (BP 20)[a]
3	Linalool	Film thickness: 0,25 µm
4	β-Elemene	Oven temperature: isothermal at 65 °C for 5 min, then temperature programming from 65 °C to 185 °C at a rate of 2°C/min, temperature programming from 185 °C to 230 °C at a rate of 3 °C/min, isothermal at 230 °C for 35 min
5	neral	Injector temperature: 230 °C
6	α-Zingiberene	Detector temperature: 250 °C
7	β-Bisabolene + Geranial	Detector: flame ionization type
8	α-Farnesene	Carrier gas: hydrogen
9	β-Sesquiphellandrene + ar-Curcumene	Volume injected: 0,2 µl
10	Geraniol	Pre-column pressure: 152 KPa
		Split ratio: 1/100

t time

[a] 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.

Figure A.6 — Typical chromatogram taken on a polar column for essential oil of ginger, produced in West Africa

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 ginger

The mean value is about +66 °C (China), +78 °C (India and West Africa).

NOTE Obtained with closed cup[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, *Essential oils — General guidance on the determination of flashpoint*

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

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