BS ISO 3517:2012

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Essential oil of neroli (*Citrus aurantium* L., syn. *Citrus amara* Link, syn. *Citrus bigaradia* Loisel, syn. *Citrus vulgaris* Risso)

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The UK participation in its preparation was entrusted to Technical Committee AW/54, Essential oils.

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Published by BSI Standards Limited 2012

ISBN 978 0 580 66093 1

ICS 71.100.60

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2012.

Amendments issued since publication

Date	Text affected

BS ISO 3517:2012

INTERNATIONAL STANDARD

ISO 3517

Third edition
2012-08-01

Essential oil of neroli (*Citrus aurantium* L., syn. *Citrus amara* Link, syn. *Citrus bigaradia* Loisel, syn. *Citrus vulgaris* Risso)

*Huile essentielle de néroli bigaradier (*Citrus aurantium *L., syn.* Citrus amara *Link, syn.* Citrus bigaradia *Loisel, syn.* Citrus vulgaris *Risso)*

Reference number
ISO 3517:2012(E)

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Published in Switzerland

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Foreword

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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.

ISO 3517 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This third edition cancels and replaces the second edition (ISO 3517:2002), which has been technically revised.

INTERNATIONAL STANDARD ISO 3517:2012(E)

Essential oil of neroli (*Citrus aurantium* L., syn. *Citrus amara* Link, syn. *Citrus bigaradia* Loisel, syn. *Citrus vulgaris* Risso)

1 Scope

This International Standard specifies certain characteristics of the essential oil of neroli (*Citrus aurantium* L., syn. *Citrus amara* Link, syn. *Citrus bigaradia* Loisel, syn. *Citrus vulgaris* Risso), cultivated principally in Tunisia, Morocco, and Egypt, in order to facilitate assessment of its quality.

2 Normative references

The following referenced documents are indispensable for the application 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/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 with ethanol*

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

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

ISO 22972, *Essential oils — Analysis by gas chromatography on chiral capillary columns — General method*

3 Terms and definitions

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

3.1
essential oil of neroli
essential oil obtained by steam distillation or hydrodistillation of the flowers of *Citrus aurantium* L., syn. *Citrus amara* Link, syn. *Citrus bigaradia* Loisel, syn. *Citrus vulgaris* Risso, of the *Rutaceae* family

NOTE For information on the CAS number, see ISO/TR 21092.[2]

4 Requirements

4.1 Appearance

Clear mobile liquid.

4.2 Colour

Pale yellow to amber with a slight blue fluorescence.

4.3 Odour

Fresh, recalling that of orange blossom.

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

Tunisia and Morocco		Egypt	
Minimum:	0,863	Minimum:	0,870
Maximum:	0,876	Maximum:	0,880

4.5 Refractive index at 20 °C

Tunisia and Morocco		Egypt	
Minimum:	1,464	Minimum:	1,465
Maximum:	1,474	Maximum:	1,472

4.6 Optical rotation at 20 °C

Tunisia and Morocco	Egypt
Between +2° and +12°	Between +2° and +11°

4.7 Miscibility with 85 % volume fraction ethanol at 20 °C

It shall not be necessary to use more than 3,5 volumes of 85 % volume fraction ethanol to obtain a clear solution with 1 volume of essential oil.

4.8 Acid value

Maximum: 2.

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.

4.10 Chirality

Information on the chirality is given in Annex C.

4.11 Flashpoint

Information on the flashpoint is given in Annex B.

Table 1 — Chromatographic profile

Component	Tunisia and Morocco		Egypt	
	min. %	max. %	min. %	max. %
α-Pinene	n.d.[a]	2,0	n.d.[a]	2,0
Sabinene	n.d.[a]	3,0	n.d.[a]	3,0
β-Pinene	5,0	17,0	2,0	8,0
Myrcene	1,0	4,0	1,0	4,0
Limonene	9,0	18,0	7,0	17,0
(*E*)-β-Ocimene	3,0	9,0	3,0	9,0
Linalol	26,0	48,0	26,0	55,0
α-Terpineol	2,0	5,5	2,0	8,0
Linalyl acetate	1,5	15,0	3,0	20,0
Neryl acetate	n.d.[a]	2,5	n.d.[a]	7,0
Geranyl acetate	1,0	5,0	1,0	5,0
(*E*)-Nerolidol	1,0	5,0	0,5	5,0
(2*E*,6*E*)-Farnesol	0,5	4,0	0,5	4,0
Nerol	0,9	1,2	0,5	2,0
Geraniol	2,5	3,1	1,0	5,0
Indole	0,1	0,3	n.d.[a]	0,5
Methyl anthranilate	0,1	1,0	n.d.[a]	1,0

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

[a] Not detectable.

5 Sampling

Sampling shall be performed in accordance with ISO 212.

Minimum volume of the final 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 Miscibility in ethanol, 85 % 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.

6.7 Chirality

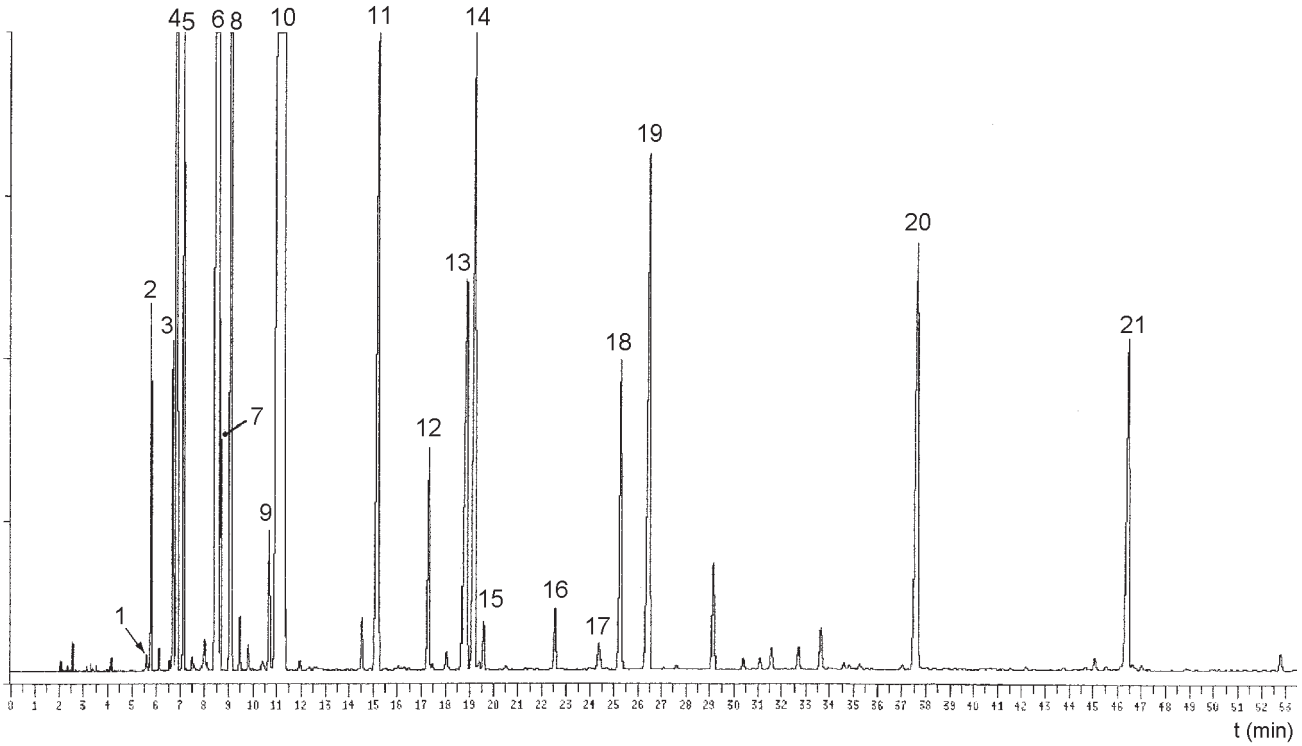
Determine the chirality in accordance with ISO 22972.

7 Packaging, labelling and marking

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

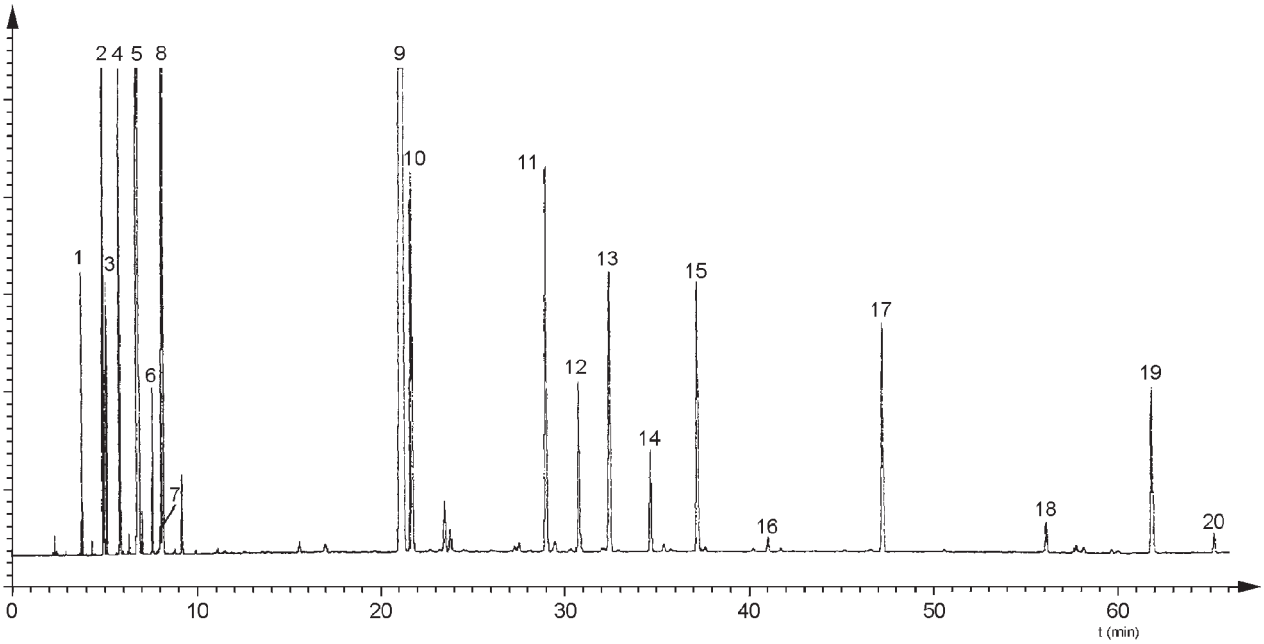
Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of neroli (*Citrus aurantium* L., syn. *Citrus amara* Link, syn. *Citrus bigaradia* Loisel, syn. *Citrus vulgaris* Risso)



Peak identification		**Operating conditions**
1	α-Thujene	Column: silica capillary; length 30 m; internal diameter 0,25 mm
2	α-Pinene	Stationary phase: poly(dimethylsiloxane) (SE 30[a])
3	Sabinene	Film thickness: 0,25 µm
4	β-Pinene	Oven temperature: temperature programming from 70 °C to 250 °C at a rate of 2 °C/min
5	Myrcene	
6	Limonene	Injector temperature: 250 °C
7	(*Z*)-β-Ocimene	Detector temperature: 250 °C
8	(*E*)-β-Ocimene	Detector: flame ionization type
9	γ-Terpinene	Carrier gas: hydrogen
10	Linalol + phenylacetronitrile	Volume injected: 0,3 µl
11	α-Terpineol	Carrier gas flow rate: 1 ml/min
12	Nerol	Split ratio: 1/100
13	Geraniol	
14	Linalyl acetate	*t* time
15	Indole	
16	Methyl anthranilate	[a] SE 30 is an 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.
17	Terpenyl acetate	
18	Neryl acetate	
19	Geranyl acetate	
20	(*E*)-Nerolidol	
21	(2*E*,6*E*)-Farnesol	

Figure A.1 — Typical chromatogram taken on an apolar column



Peak identification		**Operating conditions**
1	α-Thujene + α-pinene	Column: silica capillary; length 30 m; internal diameter 0,25 mm
2	β-Pinene	Stationary phase: poly(ethyleneglycol) 10 000 (Supelcowax 10[a])
3	Sabinene	Film thickness: 0,25 µm
4	Myrcene	Oven temperature: temperature programming from 70 °C to 250 °C at a rate of 2 °C/min
5	Limonene	
6	(*Z*)-β-Ocimene	Injector temperature: 250 °C
7	γ-Terpinene	Detector temperature: 250 °C
8	(*E*)-β-Ocimene	Detector: flame ionization type
9	Linalol	Carrier gas: nitrogen
10	Linalyl acetate	Volume injected: 0,3 µl
11	α-Terpineol + Terpenyl acetate	Carrier gas flow rate: 1 ml/min
12	Neryl acetate	Split ratio: 1/100
13	Geranyl acetate	
14	Nerol	*t* time
15	Geraniol	
16	Phenylacetronitrile	[a] Supelcowax 10 is an 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.
17	(*E*)-Nerolidol	
18	Methyl anthranilate	
19	(2*E*,6*E*)-Farnesol	
20	Indole	

Figure A.2 — 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 neroli

The indicative value is +61 °C.

NOTE Obtained with “Luchaire”[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.

Annex C
(informative)

Chirality

C.1 Enantiomeric distribution

Perform the analysis of essential oils by gas chromatography on capillary chiral columns. The relative content of each of these enantiomers shall be situated within the limits given in Table C.1.

Table C.1 — Enantiomeric distribution of the chiral compounds

Component	Distribution
S-(+)-Linalyl acetate	<5 %

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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