
Oil of bergamot petitgrain
[*Citrus bergamia* (Risso et Poit.)]

Huile essentielle de petitgrain bergamotier [Citrus bergamia (Risso et Poit.)]

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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 8900 was prepared by Technical Committee ISO/TC 54, *Essential oils*.

This second edition cancels and replaces the first edition (ISO 8900:1987), which has been technically revised.

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Oil of bergamot petitgrain [*Citrus bergamia* (Risso et Poit.)]

1 Scope

This International Standard specifies certain characteristics of the oil of bergamot petitgrain [*Citrus bergamia* (Risso et Poit.)], 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 709, *Essential oils — Determination of ester value*

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

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

ISO 11024-1, *Essential oils — General guidance on chromatographic profiles — Part 1: Preparation of chromatographic profiles for presentation in standards*

ISO 11024-2, *Essential oils — General guidance on chromatographic profiles — Part 2: Utilization of chromatographic profiles of samples of essential oils*

3 Terms and definitions

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

3.1

oil of bergamot petitgrain

essential oil obtained by steam distillation of the leaves and/or the small fruits left in the twigs of *Citrus bergamia* (Risso et Poit.), of the Rutaceae family

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

4 Requirements

4.1 Appearance

Clear liquid.

4.2 Colour

Pale yellow or amber.

4.3 Odour

Characteristic.

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

Minimum: 0,886

Maximum: 0,894

4.5 Refractive index at 20 °C

Minimum: 1,460 0

Maximum: 1,465 0

4.6 Optical rotation at 20 °C

Between -4° and $+3^{\circ}$.

4.7 Miscibility in ethanol, 70 % (volume fraction), at 20 °C

It shall not be necessary to use more than 3 volumes of ethanol 70 % (volume fraction) to obtain a clear solution with 1 volume of essential oil.

4.8 Acid value

Maximum: 2

4.9 Ester value

Minimum: 128

Maximum: 195

4.10 Chromatographic profile

Analysis of the essential oil shall be carried out by gas chromatography. In the chromatogram obtained, the representative and characteristic components shown in Table 1 shall be identified. 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

Components	Minimum %	Maximum %
β -Pinene	1,2	1,8
Myrcene	1,2	1,8
Limonene ^a	2,3	3,0
<i>trans</i> - β -Ocimene	1,2	1,6
Linalol	9,0	12,3
Linalyl acetate	63,8	71
β -Caryophyllene	1,0	1,2
α -Terpineol	2,0	2,7
Neryl acetate	2,0	2,4
Geranyl acetate	2,2	2,7
Nerol	0,4	0,8

^a The limonene is regarded to be predominantly L-limonene based on wet physical testing. It is believed that there might be a small amount of D-limonene present but the exact quantity is unknown.

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

4.11 Flashpoint

Information on the flashpoint is given in Annex B.

5 Sampling

See ISO 212.

Minimum volume of test sample: 50 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}

See ISO 279.

6.2 Refractive index at 20 °C

See ISO 280.

6.3 Optical rotation at 20 °C

See ISO 592.

6.4 Miscibility in ethanol 70 %, (volume fraction), at 20 °C

See ISO 875.

6.5 Acid value

See ISO 1242.

6.6 Ester value

See ISO 709.

6.7 Chromatographic profile

See ISO 11024-1 and ISO 11024-2.

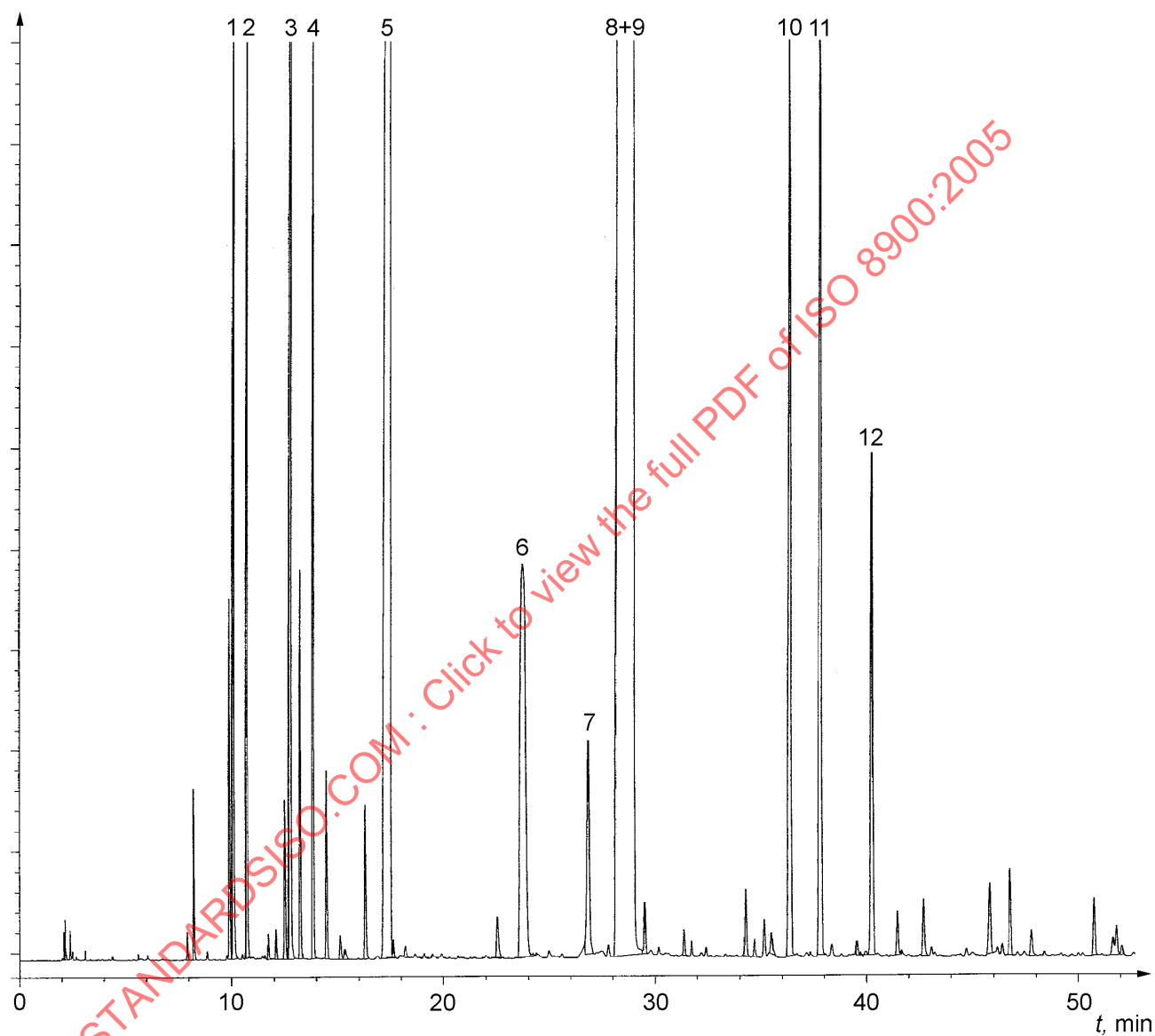
7 Packaging, labelling, marking and storage

See ISO/TR 210 and ISO/TR 211.

Annex A

(informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of bergamot petitgrain [*Citrus bergamia* (Risso et Poit.)]



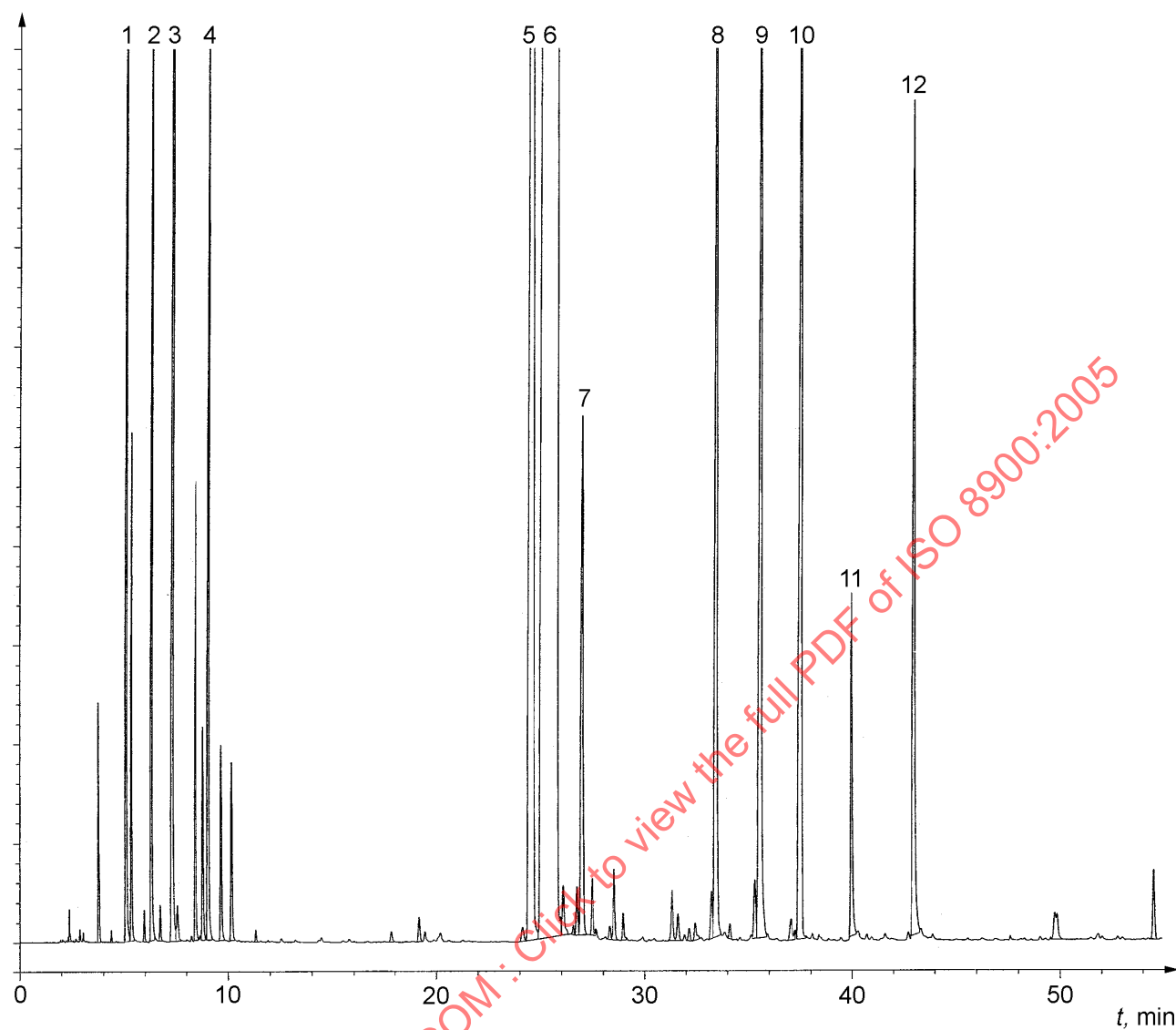
Peak identification

- 1 β -Pinene
- 2 Myrcene
- 3 Limonene
- 4 *trans*- β -Ocimene
- 5 Linalol
- 6 α -Terpineol
- 7 Nerol
- 8 Geraniol
- 9 Linalyl acetate
- 10 Neryl acetate
- 11 Geranyl acetate
- 12 β -Caryophyllene

Operating conditions

Column: silica capillary; length 30 m; internal diameter 0,20 mm
 Stationary phase: 5% diphenylpolysiloxane – 95% dimethylpolysiloxane (SP-5®)
 Film thickness: 0,20 μ m
 Oven temperature: temperature programming from 60 °C to 180 °C at a rate of 1,75 °C/min
 Injector temperature: 250 °C
 Detector temperature: 250 °C
 Detector: flame ionization type
 Carrier gas: helium
 Volume injected: 0,1 μ l
 Carrier gas flow rate: 1 ml/min
 Split ratio: 1/100

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

**Peak identification**

- 1 β -Pinene
- 2 Myrcene
- 3 Limonene
- 4 *trans*- β -Ocimene
- 5 Linalol
- 6 Linalyl acetate
- 7 β -Caryophyllene
- 8 α -Terpineol
- 9 Neryl acetate
- 10 Geranyl acetate
- 11 Nerol
- 12 Geraniol

Operating conditions

Column: silica capillary; length 30 m; internal diameter 0,20 mm
 Stationary phase: polyethylene glycol (Supercowax-10®)
 Film thickness: 0,20 μ m
 Oven temperature: temperature programming from 60 °C to 180 °C at a rate of 1,75 °C/min
 Injector temperature: 250 °C
 Detector temperature: 250 °C
 Detector: flame ionization type
 Carrier gas: helium
 Volume injected: 0,1 μ l
 Carrier gas flow rate: 1 ml/min
 Split ratio: 1/100

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) concluded that it was difficult to recommend a single apparatus for standardization purposes, given that

- there is 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 in an informative annex to each International Standard, in order to meet the requirements of the interested parties.

The equipment with which this value was obtained should be specified.

For further information see ISO/TR 11018.

B.2 Flashpoint of the essential oil of bergamot petitgrain

The mean value is +75 °C.

NOTE Obtained with "Pensky Martens" equipment.