INTERNATIONAL STANDARD

ISO 22769

Second edition
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Essential oil of Australian sandalwood [*Santalum spicatum* (R.Br.) A.DC.]

*Huile essentielle de bois de santal, type australien [*Santalum spicatum *(R.Br.) A.DC.]*

Reference number
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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 22769:2009), which has been technically revised.

The main changes are as follows:

— the structure of the standard has been revised;

— Table 2 has been revised for minimum and maximum values for components *Z*-α-Santalol, *Z*-β-Santalol, *E,E*-Farnesol and *Z*-Lanceol;

— Annex A has been replaced with updated Figures A.1 and A.2 and with revised peak identification and operating conditions columns.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Essential oil of Australian sandalwood [*Santalum spicatum* (R.Br.) A.DC.]

1 Scope

This document specifies certain characteristics of the oil of Australian sandalwood [*Santalum spicatum* (R.Br.) A.DC.], with a view to facilitating the assessment of its quality.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/TS 210, *Essential oils — General rules for packaging, conditioning and storage*

ISO/TS 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 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.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
essential oil of Australian sandalwood
essential oil obtained by steam distillation from the heartwood of the tree *Santalum spicatum* (R.Br.) A.DC. occurring in western Australia

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

4 Requirements

4.1 General requirements

Essential oil of Australian sandalwood (*Santalum spicatum*) shall meet the requirements as given in Table 1.

Table 1 — Requirements for the essential oil of Australian sandalwood (*Santalum spicatum*)

Characteristics	Requirements	ISO test method
Appearance	Clear, viscous liquid at 20 °C	—
Colour	Almost colourless to yellow	—
Odour	Sweet, woody and persistent	—
Relative density at 20 °C d_{20}^{20}	0,945 to 0,980	ISO 279
Refractive index at 20 °C	1,500 to 1,517	ISO 280
Optical rotation at 20 °C	Range from −16° to +4°	ISO 592
Miscibility in ethanol	It shall not be necessary to use more than five volumes of ethanol 70 % (volume fraction) to obtain a clear solution with one volume of essential oil	ISO 875

4.2 Chromatographic profile

Carry out the analysis of the essential oil by gas chromatography. Determine the chromatographic profile in accordance with the ISO 11024 series. Identify in the chromatogram obtained the representative and characteristic components shown in Table 2. The proportions of these components, indicated by the integrator, shall be as shown in Table 2. This constitutes the chromatographic profile of the essential oil.

Table 2 — Chromatographic profile

Component	Minimum %	Maximum %
Z-α-Santalol	15,0	30,0
epi-α-Bisabolol	0,2	12,5
Z-β-Santalol	4,5	20,0
epi-β-Santalol	0,5	3,5
Z-α-*trans*-Bergamotol	2,0	10,0
E,E-Farnesol	2,5	18,0
Z-Nuciferol	2,0	15,0
Z-Lanceol	0,5	10,0
NOTE The chromatographic profile is normative, contrary to typical chromatograms given for information in Annex A (see Figures A.1 and A.2).		

5 Flashpoint

Information on the flashpoint is given in Annex B.

6 Sampling

Sampling shall be performed in accordance with ISO 212. The minimum volume of the test sample is 50 ml.

NOTE This volume is sufficient for each of the tests specified in this document to be carried out at least once.

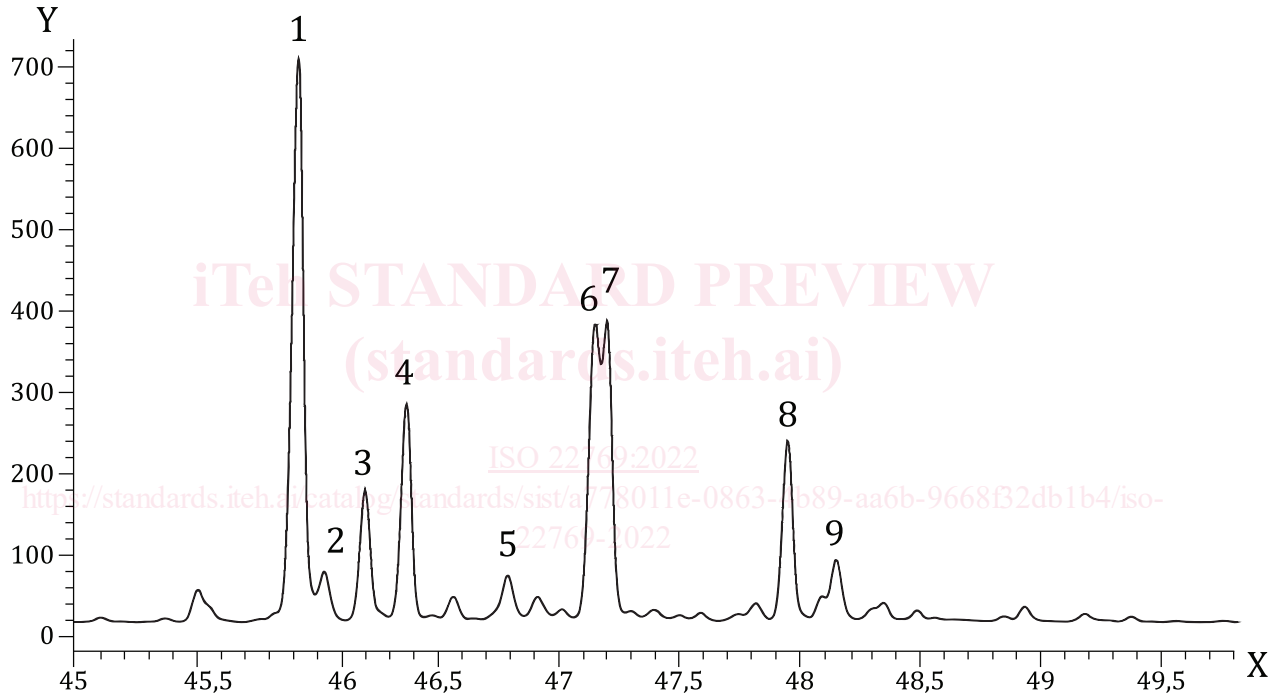
7 Packaging, labelling, marking and storage

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

Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of essential oil of Australian sandalwood [*Santalum spicatum* (R.Br.) A.DC.]

It is found that peak resolution on an apolar column [e.g. ZB5[a]] is not satisfactory. Therefore, the use of only the polar column as shown in Figure A.2 is recommended. The chromatogram in Figure A.1 (an apolar column) is for information only.



Peak identification

1 *Z*-α-Santalol

2 *epi*-α-Bisabolol

3 *Z*-α-*trans*-Bergamotol

4 *E,E*-Farnesol

5 *epi*-β-Santalol

6 *Z*-β-Santalol

7 *Z*-γ-curcumen-12-ol + *Z*-Nuciferol

8 *Z*-β-Curcumen-12-ol

9 *Z*-Lanceol

Key

Y detector response (pA)

X time (min)

Operating conditions

Column: fused silica capillary; length 50 m; internal diameter 0,25 mm

Stationary phase: 5 % phenyl, 95 % polydimethylsiloxane [ZB5[a]]

Film thickness: 0,25 µm

Oven temperature: isothermal at 50 °C for 1 min, then temperature programming from 50 °C to 300 °C at a rate of 4 °C/min, then isothermal at 300 °C for 10 min

Injector temperature: 280 °C

Detector temperature: 300 °C

Detector: flame ionization type

Carrier gas: hydrogen

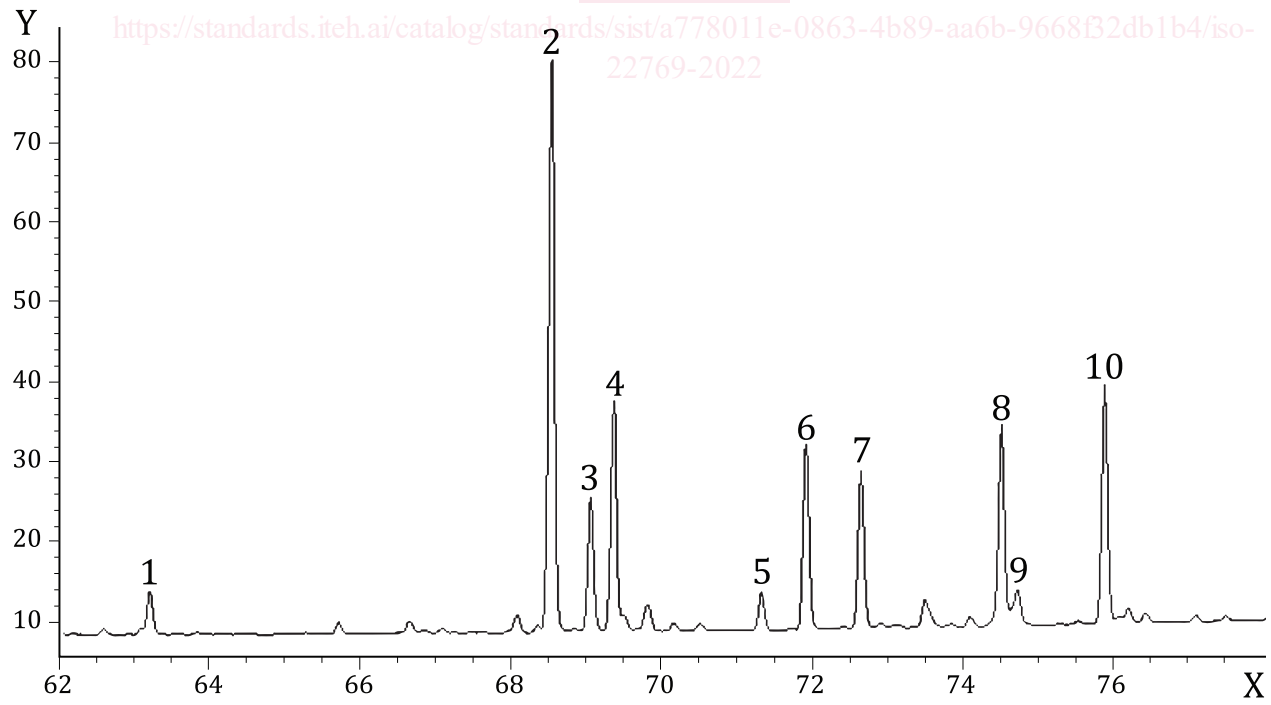
Volume injected: 0,1 µl

Carrier gas flow rate: 1 ml/min

Split ratio: 1/20

[a] ZB5 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.

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



Peak identification

1 *epi*-α-Bisabolol

2 *Z*-α-Santalol

3 *Z*-α-*trans*-Bergamotol

4 *E*,*E*-Farnesol

5 *epi*-β-Santalol

6 *Z*-β-Santalol

7 *Z*-γ-Curcumen-12-ol

8 *Z*-β-Curcumen-12-ol

9 *Z*-Lanceol

10 *Z*-Nuciferol

Operating conditions

Column: fused silica capillary; length 50 m; internal diameter 0,22 mm

Stationary phase: poly(ethylene glycol) (BP20[a])

Film thickness: 0,25 µm

Oven temperature: isothermal at 70 °C for 10 min, then temperature programming from 70 °C to 220 °C at a rate of 2 °C/min, then isothermal at 220 °C for 20 min

Injector temperature: 250 °C

Detector temperature: 300 °C

Detector: flame ionization type

Carrier gas: hydrogen

Volume injected: 0,1 µl

Carrier gas flow rate: 0,8 ml/min

Split ratio: 1/100

Key

Y detector response (pA)

X time (min)

[a] BP20 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.

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 a wide variation in the chemical composition of essential oils;

— the volume of the sample needed in certain requirements would be too costly for highly 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 annex 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.

B.2 Flashpoint of the essential oil of Australian sandalwood [*Santalum spicatum* (R.Br.) A.DC.]

The mean value is +140 °C.

NOTE Obtained with “Setaflash” equipment[1)].

1) Setaflash 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.