International Standard

ISO 3518

Fourth edition
2025-01

Essential oil of sandalwood (*Santalum album* L.)

*Huile essentielle de bois de santal (*Santalum album *L.)*

Reference number
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Foreword

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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 document 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).

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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 fourth edition cancels and replaces the third edition (ISO 3518:2022), which has been technically revised.

The main changes are as follows:

— in Table 2, the range for Z-lanceol has changed and a superscript for the naming of components has been added;

— in Figure A.2, some operating conditions have been modified;

— in Figures A.1 and A.2, a superscript for the naming of components has been added.

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 sandalwood (*Santalum album* L.)

1 Scope

This document specifies certain characteristics of the essential oil of sandalwood (*Santalum album* L.), in order to facilitate 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 210, *Essential oils — General requirements and guidelines for packaging, conditioning and storage*

ISO 211, *Essential oils — General requirements 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 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 sandalwood
essential oil obtained by steam distillation of the heartwood of *Santalum album* L., of the Santalaceae family

Note 1 to entry: For information on the characterization of this essential oil, see ISO/TR 21092.

4 Requirements

4.1 General requirements

Essential oil of sandalwood (*Santalum album* L.) shall meet the requirements and follow the test methods given in Table 1.

Table 1 — Requirements for essential oil of sandalwood (*Santalum album* L.)

Characteristics	Requirements	ISO test method
Appearance	Clear, slightly viscous liquid	—
Colour	Almost colourless to golden yellow	—
Odour	Characteristic, sweet, woody and persistent	—
Relative density at 20 °C d_{20}^{20}	0,968 to 0,983	ISO 279
Refractive index at 20 °C	1,503 to 1,509	ISO 280
Optical rotation at 20 °C	Range from −21° to −12°	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
Ester value	Maximum 10	ISO 709 Saponification time: 1 h Relative molecular mass of santalyl acetate: M_r = 262,4

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 [a]	Minimum	Maximum
	%	%
Z-α-Santalol	41,0	55,0
Z-β-Santalol	16,0	24,0
E,E-Farnesol	n.d. [b]	1,0
Z-Lanceol	n.d. [b]	5,0

NOTE The chromatographic profile specified in this table is required, contrary to typical chromatograms given for information in Annex A (see Figures A.1 and A.2).

[a] For the naming of the components, see ISO/TS 24106.

[b] n.d. Not detected.

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 25 ml.

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

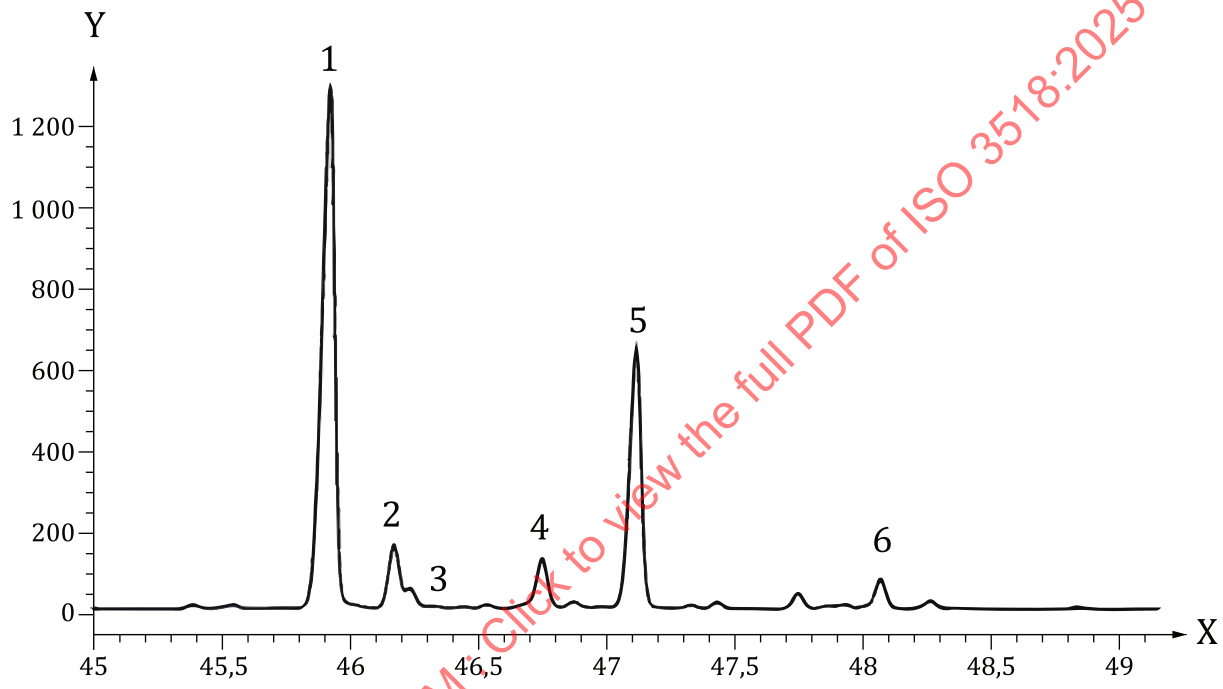
7 Packaging, labelling, marking and storage

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

Annex A
(informative)

Typical chromatograms of the analysis by gas chromatography of the essential oil of sandalwood (*Santalum album* L.)

It has been found that the resolution on an apolar column (e.g. ZB5) 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.



Key

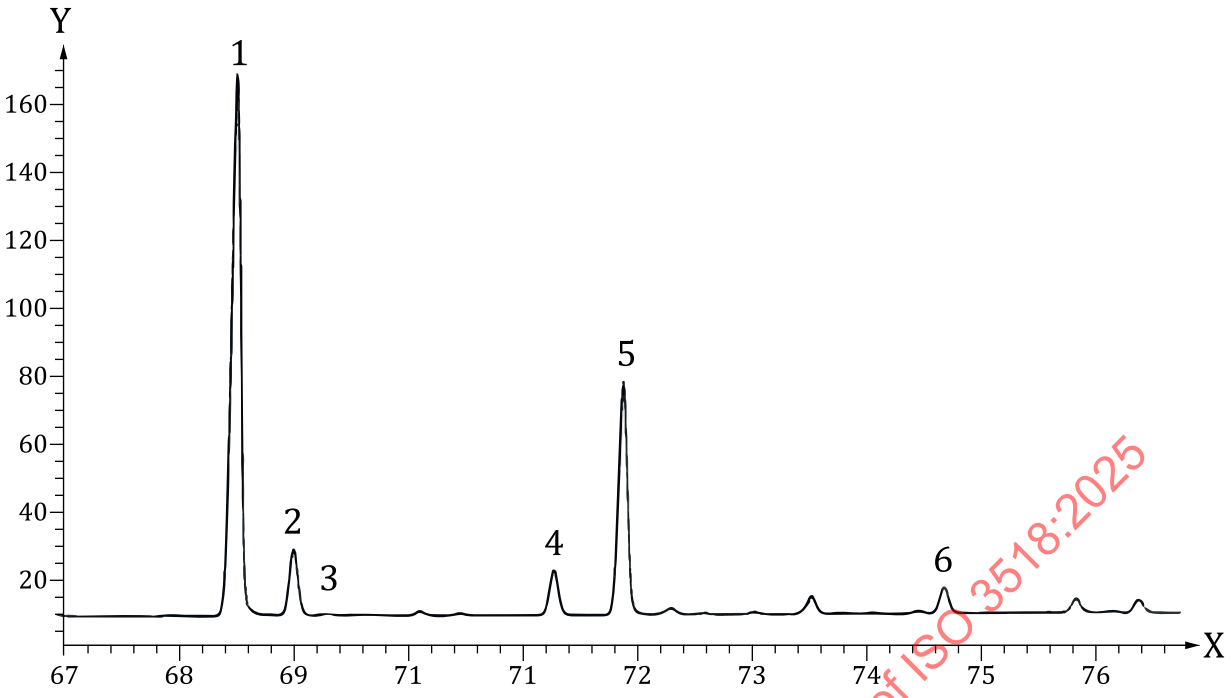
X time (min)

Y detector response (pA)

Peak identification		**Operating conditions**
1	*Z*-α-santalol	Column: fused silica capillary; length 50 m; internal diameter 0,25 mm
2	*Z*-α-trans-bergamotol	Stationary phase: 5 % phenyl, 95 % polydimethylsiloxane (ZB5[a])
3	*E,E*-farnesol	Film thickness: 0,25 µm
4	*epi*-β-santalol	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
5	*Z*-β-santalol	Injector temperature: 280 °C
6	*Z*-lanceol	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



Key

X time (min)

Y detector response (pA)

Peak identification		**Operating conditions**
1	*Z*-α-santalol	Column: fused silica capillary; length 50 m; internal diameter 0,22 mm
2	*Z*-α-trans-bergamotol	Stationary phase: poly(ethylene glycol) (BP20[a])
3	*E,E*-farnesol	Film thickness: 0,25 µm
4	*epi*-β-santalol	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
5	*Z*-β-santalol	Injector temperature: 250 °C
6	*Z*-lanceol	Detector temperature: 280 °C
		Detector: flame ionization type
		Carrier gas: hydrogen
		Volume injected: 0,3 µl
		Carrier gas flow rate: 1,0 ml/min
		Split ratio: 1/50

[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 for certain test equipment is incompatible with the high price of 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 shall be specified.

For further information, see ISO/TR 11018.

B.2 Flashpoint of the essential oil of sandalwood (*Santalum album* L.)

The mean value is +138 °C.

NOTE This can be obtained with “Luchaire” equipment.